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Annual Report of the SECRETARY OF THE INTERIOR



FISCAL YEAR ENDED JUNE 30, 1941

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Annual Report

of the S E C R E T A R Y

O F T H E I N T E R I O R



FISCAL YEAR ENDED JUNE 30, 1941

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UNITED STATES DEPARTMENT OF THE INTERIOR

HAROLD L. ICKES, *Secretary*

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BRIGHTLY THE STAR OF FREEDOM SHINES

Symbol of Freedom in a Democracy, the Statue of Liberty in New York Harbor is maintained by the National Park Service of the United States Department of the Interior as an everlasting reminder to the world of a Nation dedicated to future greatness by the devotion of its citizens and the conservation of its natural resources.

Letter of Transmittal

The Secretary of the Interior

HAROLD L. ICKES, Secretary

Washington, D. C.

MY DEAR MR. PRESIDENT: You will find in this annual report a graphic story of how the resources owned by 133 million people have been mobilized to deal with the crisis that our Nation faces. With the defense program making unprecedented calls for raw material, the work of the Department of the Interior for the fiscal year ending June 30, 1941, became infinitely more than conservation of natural resources for conservation's sake alone. To this great task was added the responsibility for the wise, but rapid development of our resources for preparedness and defense.

The struggle abroad has opened our eyes, as never before, to the extent and the possibilities of America's resources. We have been enabled to turn to our natural heritage and in the wealth of minerals, water power, grazing lands, and timber find the vital necessities for constructing our physical defenses. In order that the Nation may fulfill its function as an arsenal of democracy, we have hastened the development of hydroelectric power in the West. We have never lost sight of more and greater power production as an inevitable objective for a progressive age, but with the quickened tempo of defense needs we have stepped up, by years, the schedules originally set for these great projects. To this, we can attribute the speed in construction work on 36 projects in 14 States. The initial production of power at Grand Coulee Dam was months ahead of schedule. The Bonneville Power Administration power sales alone made possible the manufacture of enough aluminum pig metal to build one out of every four planes. Other plants produced additional power as the mobilization of democracy made it possible for us to compress into mere months the construction and power-installation schedules of years.

This same stimulus quickened the activities of bureaus throughout the Department. In another field, the Bureau of Mines, in cooperation with the Geological Survey, hastened its work of locating and evaluating deposits of strategic and critical minerals. The Bureau's studies indicate that we may, in an emergency, produce our own sup-

ply of ferromanganese. The production of helium gas in the world's only helium plant was increased until it soon will be producing nearly 36 million cubic feet annually. The Bureau's experiments in producing gasoline from coal advanced notably.

Even in those bureaus whose relationship to national defense is not so readily apparent, greater activity has been in evidence. Contributions to defense were forthcoming from such agencies as the Fish and Wildlife Service, the National Park Service, the Grazing Service, the Office of Land Utilization, and other agencies.

This report records the role that conservation has played in the national defense. A study of our achievements will show how important that role is.

Bureau of Reclamation

The Bureau of Reclamation is not only conserving the water resources of the West for the irrigation of more than 10,000,000 acres of thirsty land, it is making important contributions to national defense and paving the way for post-emergency requirements.

To meet the skyrocketing demand for power for national defense, the Bureau of Reclamation speeded up its power production for airplane factories, aluminum plants, and other defense industries. Four new power plants on reclamation projects began operations during the year; installation of additional generating equipment was rushed in order to double existing capacity by 1943; one new project was authorized; and a list of 50 potential projects with power possibilities was submitted to the Congress for consideration.

At the close of the year, 28 power plants were in operation at 17 projects with a total installed capacity of 953,962 kilowatts—an all-time high exceeding the capacity of all electric plants on the Pacific coast in 1912. A highlight of power activities was attained on March 22 when the first power from Grand Coulee Dam surged over the Bonneville-Grand Coulee transmission line. Two 10,000-kilowatt station-service units began operations. Three of the huge 108,000-kilowatt generating units are scheduled to go into operation by February 1942, and three more in 1943, by which time Grand Coulee will rank second only to Boulder Dam as the largest producer of hydroelectric energy in the world. Boulder Dam's installed capacity of 704,800 kilowatts, or a little more than half its ultimate capacity of 1,322,300 kilowatts, will be increased by August 1942 to 962,300 kilowatts with the installation of three additional units. Power from Boulder Dam is serving the country's largest airplane industries in southern California, and will furnish power for aluminum and magnesium plants in the vicinity.

The West enjoyed one of its best water years in a generation. The 73 reservoirs in operation on reclamation projects on June 1 contained

41½ million acre-feet, or 13,000 billion gallons of water. The largest was Lake Mead at Boulder Dam, where storage rose to more than 30,000,000 acre-feet, the greatest amount ever impounded in the reservoir. All five reservoirs of the Salt River project spilled for the first time. Their storage had reached the maximum capacity of 1,894,800 acre-feet, contrasted with 22,000 acre-feet last year.

With the expansion of its irrigation and power activities, the Bureau was serving, at the close of the fiscal year, more than 4,700,000 persons—a population greater than that living in the 11 Mountain and Pacific States when the reclamation law was enacted in 1902. On 36 projects in operation there were 57,441 irrigated farms on which reside 214,781 persons. In 279 cities and towns created or maintained by the project farms, there was a population of 688,134. More than 20,000 additional farms, with a population of approximately 100,000 persons, received supplemental water supplies from project works. Hundreds of churches and schools in the project areas reflect the social influence of the transformation of desert wastes into productive, self-sustaining communities.

In 1940 the Bureau was prepared to serve water for the irrigation of 4,168,168 acres—the largest area since its operations began. This area represents an increase of 278,628 acres over that reported for 1939.

The crop returns from the 3,316,030 acres of land in cultivation actually irrigated in 1940 were valued at \$117,788,677, an increase of \$3,705,883 over the total for the previous year.

Under the construction program in progress, 2,370,000 acres of land will be brought into cultivation. The largest development in this program is the Columbia Basin project in Washington, which will irrigate 1,200,000 acres. More than 3,800,000 acres of land now inadequately irrigated will receive more stable supplies through the facilities now under construction, which will bring to about 10,958,000 acres the land to be served by the current program.

Through the water conservation and utilization program, designed to rehabilitate and stabilize the Great Plains and other western agricultural regions, the area of 155,000 acres to be benefited will probably be more than doubled as new projects now under investigation are undertaken.

The Bureau's largest construction program was pushed forward on 36 projects in 14 States during the year. Of the 17 dams under construction, 8 were completed, which brought to 163 the total number of dams completed by the Bureau since 1902. Several are outstanding in height and volume. Grand Coulee Dam is 550 feet high, 4,300 feet long, and contains 10,500,000 cubic yards of concrete, making it the largest concrete structure in the world. Shasta Dam, 560 feet high, will be second in height to the 726-foot Boulder Dam, the highest in the world.

Grand Coulee Dam, the principal construction feature of the Columbia Basin project, was virtually completed. Land classification and appraisal of the 1,200,000 acres to be served by the project were nearing completion. Good progress was made on plans for the development and settlement of the area, which probably will begin in 1944 or 1945, when water is available for the first blocks of land. Hatcheries were completed at three stations for the conservation of migratory fish in the Columbia River.

The Central Valley project in California, to benefit 2,000,000 acres of rich and highly cultivated land, in addition to providing protection from floods, repulsing salt-water intrusions from San Francisco Bay, and generating hydroelectric power, was approximately one-fourth completed. Shasta Dam, on the Sacramento River in the north, was more than half finished; the Southern Pacific Railroad relocation was completed with the exception of the high double-deck Pit River bridge; the contract for Friant Dam on the San Joaquin River in the south was more than 75 percent completed; a 9½-mile section of the 40-mile Contra Costa Canal was completed; and work was begun on the Madera Canal.

With eight of the large 82,500-kilowatt generators and one of the smaller 40,000-kilowatt generators in operation at the Boulder Dam power plant, approximately 3,200,000,000 kilowatt-hours of energy were generated, and collections by the Government from the sale of electric energy totaled more than \$6,000,000, with a monthly maximum of \$767,927 in August 1940. The Boulder Canyon Adjustment Act of July 19, 1940, which provided for the adjustment of rates and charges for electrical energy generated at Boulder Dam, was effectuated in May 1941 by the execution of agency contracts and new contracts with power allottees.

In Colorado, good progress was made on the Colorado-Big Thompson project, designed to provide a supplemental water supply for 615,000 acres of land. Green Mountain Dam, on the Blue River, was almost 50 percent completed, and contractors finished two sections of the 13.1-mile Continental Divide Tunnel. Two additional sections were under construction.

Marshall Ford Dam, on the Colorado River in Texas, was being raised to a height of 270 feet with 67 percent of the work completed under a contract let during the year.

The year's work brought the construction accomplishments of the Bureau to impressive totals: 85 storage and 78 diversion dams; 50 power plants; 364 pumping plants; 367 tunnels; 16,017 miles of canals and laterals; 5,931 miles of ditches and drains; 206,043 canal structures; 14,072 bridges; 22,504 culverts; 2,175 miles of pipe; 6,427 flumes; 3,735 miles of roads; and 5,403 miles of transmission lines.

Long-needed action was taken by the Congress at the close of the year to expedite the construction of all projects financed from the seriously depleted reclamation fund by providing that additional projects be financed from the general fund of the Treasury.

The demand for the construction of multiple-purpose projects under the reclamation program continues unabated. The increase in population in the West, coupled with the industrial expansion vital to national defense, is emphasizing the feasibility of combinations of power and irrigation facilities.

By investigations into virtually every river basin in the West, the Bureau of Reclamation will have on hand a shelf-full of feasible projects which can be launched quickly to provide employment and new homes for a permanent population in the rural areas of the West and in the urban communities which they support.

No dearth of feasible projects exists. Estimates are that there is sufficient water available in the West to irrigate an additional 22,000,000 acres, and provide supplemental supplies for 11,700,000 acres. Potential water power developments, in connection with irrigation developments, would doubtless provide as much as 30,000,000 kilowatts of electric capacity, more than three times the existing installed capacity.

Bureau of Mines

Conservation of the Nation's mineral resources, as practiced for 31 years under the Bureau of Mines, paid off generously during the fiscal year when the national-defense program reflected unmistakably the sound policies of the past.

The Bureau of Mines' helium plant at Amarillo, Tex., the only plant in the world producing lightweight, noninflammable gas, established a new record with an output during the year of more than 16¼ million cubic feet, of which 15 million went for Government use.

Since even this rate of production is not adequate to meet future demands for barrage-balloon operation, for meteorological balloons, airships, and other military and naval needs, the building of a new unit and the drilling of new wells to increase plant capacity 50 per cent, were undertaken. Upon completion of these improvements, the Bureau of Mines will be able to produce approximately 36 million cubic feet of helium annually.

Investigations of domestic deposits of strategic minerals, begun by the Bureau last year, made excellent progress. Discovery of an important high-grade deposit of tungsten ore in Idaho, that is now being brought rapidly to commercial production, was one of the outstanding results of the work.

Another prospect favorable to the production of chromium ore, is being developed with the aid of funds furnished by the Reconstruc-

tion Finance Corporation. In addition, deposits of antimony, manganese, and mercury ores were found which, although of lower grade, could become valuable in an emergency. These developments are the more outstanding results of the examination by the Bureau of more than 500 possible sources of strategic minerals.

Exploratory work on many deposits that looked favorable was extensive. The magnitude of the task may be indicated by the fact that it included 76,500 feet of diamond drilling, 43,800 feet of trenching, 2,500 feet of tunneling, 8,125 feet of shaft sinking, and the building of more than 8½ miles of motor-truck trails and 6½ miles of pack trails.

Metallurgical research on minerals of strategic importance also yielded highly promising results. Studies on production of ferromanganese from the abundant, low-grade, manganiferous ores of this country, revealed definite possibilities that the United States may be able, in an emergency, to free itself from almost complete dependence upon foreign sources. Laboratory tests of a process for treating domestic ores to produce material of ferro grade have been successful, and tests on a scale large enough to provide engineering data for full-scale industrial application will be conducted upon completion of pilot plants now under construction. The work is being prosecuted with all the speed compatible with accuracy and efficiency.

The Bureau's special process for the production of magnesium by direct electrothermal reduction of magnesium-bearing ores, such as magnesite, has been further improved; and it is hoped that adjustments being incorporated will yield a method that will be suitable for immediate industrial application and thus help the Nation to overcome the shortage of this vital defense material.

The Bureau's metallurgists, chemists, and engineers have successfully devised ore-dressing methods for concentrating chromite from Nevada and California, magnesite from Washington, antimony ore from Idaho, and tungsten ore and alunite from Utah.

The threatened shortage of gasoline and oil on the Atlantic coast emphasized the value of the Bureau's economic and statistical surveys of petroleum and petroleum products, and its technical studies on pipe-line transmission. Special studies were made of eastern supply and demand, and of pipe-line mileage and capacity. An investigation of the quantity and geographic distribution of crude oils that can be used to make aviation gasoline, revealed the fact that a number of oil fields, which hitherto have not been regarded as sources of aviation gasoline, are potential producers of this essential material. Because of a rising demand and rapid shifts in imports and exports, the Bureau's periodical forecasts of demand for motor fuel and a special canvass of production and stocks of aviation gasoline contributed materially to preparedness planning. Also of value to the defense

program was the survey made of the location, type, and capacity of existing refineries.

Although the United States as a whole is not faced with a lack of resources or an immediate shortage of base supplies at production points of petroleum, the Bureau has been conducting studies, on a semicommercial scale, of the production of gasoline and other oil products from coal by the hydrogenation process. Its pilot plant tested a number of varieties of American coals to determine the quality and yields of various oil products, and results indicated that the process can be adapted to full-scale commercial production at any time in the future when natural petroleum resources show signs of serious depletion. Research was conducted also on some of the by-products of the process that have potential value in the field of plastics.

All of the Bureau's work on the economics and statistics of minerals was intensified and speeded up during the year. The data became a necessity for all agencies of Government concerned with defense production, procurement, priorities, stock-piling, export control, prices, and civilian supply. The Bureau, through long-established contact with sources of information, implemented its vast reservoir of data on amounts and trends of production, consumption, prices, stocks, technologic progress, world conditions, and international trade, for more than 100 metal and other mineral commodities, and conducted numerous special surveys and canvasses.

First-aid training, which now assumes such great importance in the preparations for civilian defense, was given by the Bureau during the year to nearly 100,000 persons, raising the total number of persons who have received certificates from the Bureau to more than 1,375,000. Of the latter number, 15,000 qualified to teach first aid, and the Bureau is keeping as up to date as possible its list of these persons, should they be needed for any civilian or military program of first-aid instruction. Approximately 75,000 persons have now received instruction in the use of gas masks, and in methods of handling explosions and fires. As part of the year's educational program in safety, 64 first-aid contests were sponsored, 16 safety associations were organized, and 913 safety meetings were attended by Bureau personnel.

Despite the progress made in promoting safety, the toll of deaths and injuries in coal mining continued at too high a level. During the year there were 7 major disasters, with a total of 155 deaths, as compared with 3 major disasters and 206 deaths for the fiscal year 1940, and no major disasters for the preceding fiscal year. Altogether the fatalities from all causes in and about coal mines amounted to approximately 1,200 for the fiscal year 1941, most of which could have been prevented by adequate precautions. In a desire to reduce this deplorable record of injuries and fatalities, and to improve the health and safety of those engaged in mining, the Congress, by passage of

the Federal Mine Inspection Act (approved May 7, 1941) empowered the Bureau to make inspections and investigations in coal mines annually and whenever it is deemed necessary, and to make public its findings. Funds to initiate activities under the act have been provided by the Congress, and plans were well advanced by the end of the year for the appointment of personnel to conduct the investigations. The work will include studies of ventilation, haulage, electricity, and explosives; investigations of harmful dusts, gases, high temperature and humidity, and other possible causes of occupational diseases; also investigations of various other factors that may cause ill health or injury to persons engaged in the mining of coal. Provision is being made for widespread dissemination of the results of the work, which when the real facts are known, should result in the correction of hazardous and improper practices and conditions.

Owing to the pressure of defense work, the Bureau has encountered some difficulty in maintaining its routine research activities. Nevertheless, valuable results have been obtained during the year, some of which have an indirect bearing on the national preparedness program. Among the more notable are an improvement in liquid-oxygen explosives that render the explosives virtually immune to ignition from fire or spark, the location of a domestic source of graphite that can be used in place of a variety formerly imported from Madagascar, methods of improving various American clays to provide suitable substitutes for varieties that were formerly imported, and methods for treating varieties of domestic low-grade bauxite ores. The increased demand for coke for steel production found the Bureau in a favorable position to provide industry with valuable data on the coking properties of various coals and blends of coal, with especial reference to the availability of western coals for making coke for munitions plants. Fuel-testing, coal-sampling, and heating studies made by Bureau of Mines engineers for other Government agencies, resulted in important economies.

Bonneville Power Administration

In the "all-out" national defense effort, the Department reports increased fruition of the Bonneville Power Administration resources.

Due to the impact of the emergency, the Bonneville Power Administration found it necessary, between September 1940, and June 1941, to speed up its activities, the net results of which at the close of the fiscal year were 321,880 kilowatts of power sold under contract; the annual rate of power income increased more than five times; the generating capacity increased nearly 250 percent; and the transmission system increased from 142.3 miles to 1,176.8 miles. Six new industrial customers were developed, all involving defense production and all new to the area west of the Mississippi.

During the fiscal year the Bonneville Power Administration power sales made possible the production of nearly 60,000,000 pounds of aluminum pig metal, and resulted in the establishment of power-using aluminum plants with a capacity sufficient to build one-fourth of all the planes scheduled for production during the ensuing 12 months.

As an immediate contribution to the defense effort, the principle of public ownership becomes doubly impressive.

During the fiscal year ending June 30, 1941, the Bonneville Power Administration was able to assume a major status not only as a utility, but in determining the exact role of the Pacific Northwest region in the program of national defense.

With the passage and signing of the "Lend-Lease Act", a revised 6-year construction program for the Bonneville Power Administration has been worked out to cover new requirements for hydroelectric power brought about by defense production. This program has been conceived on the basis of four fundamental factors, to wit: (1) the national emergency and its future influence on the industrial activity of the Pacific Northwest; (2) the actual generating capacity of existing utilities; (3) the determination of additional generating capacity at Bonneville and Grand Coulee, and; (4) a detailed schedule of necessary transmission facilities for the 5-year period beginning in 1943 to conform to estimates of power supplies and demands.

Division of Power

In order to handle more effectively an increasing number of problems incident to national defense, the Department, on April 18, 1941, established a Division of Power. Although in operation less than 3 months of the fiscal year, the Division has more than justified its existence as a clearing house for the intricate questions arising from power development, not only as they relate to national preparedness, but as they will bear on probable post-war conditions.

The Department is now concerned with the output of more than 1,228,977 kilowatts of installed capacity, in addition to having jurisdiction over the Bonneville project and the power installation of 17 reclamation projects, not to mention developments under the Office of Indian Affairs and the National Park Service.

Projects in process of construction, and projects authorized, will add another 2,221,000 kilowatts. The grand total of power is approximately 60 percent of the total present installations in the States of Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, North Dakota, Oregon, South Dakota, Utah, Washington, and Wyoming.

An additional installation of 1,500,000 kilowatts for defense purposes, over and above projects under construction and authorized, will

make the power projects under the jurisdiction of the Department equal to the total present non-Federal power installations in the 13 States named.

One of the most significant and gratifying achievements of the new Division was the development of a program, in cooperation with other departments, looking toward the full utilization of power resources for the production of light metals (aluminum and magnesium) in Government-owned plants.

Not only has the Department been able to step up time schedules of projects authorized for defense purposes, it is now studying locations for additional projects, their construction and the use of their power as they will affect the respective regions after the emergency.

With an eye on the proper peacetime use of low-cost power, the Department looks forward to the full use of labor in the areas affected, and the safeguarding of the Government's investment in power facilities.

Fish and Wildlife Administration

In the administration of the Nation's resources of living creatures in the wild, the year was notable as the first for the Fish and Wildlife Service, which was established on June 30, 1940, by a merger of the Bureau of Biological Survey and the Bureau of Fisheries. This consolidation has proved effective in promoting administrative efficiency in wild life conservation and restoration, in the mobilization of Federal facilities for service to the Nation and on behalf of the wild-life resource during the defense emergency.

Though the relationships of wildlife to national defense are not always readily apparent to the general public, the Fish and Wildlife Service has demonstrated that many notable defense contributions can be made that involve this resource—namely, the maintenance of morale by encouraging outdoor recreation, the providing of an important food supply through commercial fisheries, the protection of livestock and crops by predator and rodent control, and cooperation in direct defense activities through a personnel of highly trained and experienced field workers and technicians.

Believing that an abundant wildlife is an endowment that makes a nation worth the most zealous defense, and realizing that such a resource is of longtime importance, the Department has not only been alert to turn every possible wildlife activity to a national-defense purpose but has also been vigilant to see that during the emergency no unnecessary or irreparable damage is done to fish, bird, or mammal populations. This program has been effectively implemented by the appointment of a liaison officer from the Fish and Wildlife Service to keep informed on the activities of all defense agencies that affect fish

and wildlife and report to the Secretary any that might seem to be detrimental. Receiving considerate cooperation from the other defense agencies, this officer has been highly successful so far, and present indications are, not only will emergency purposes be served, but that permanent benefits will result.

Wildlife damage from lack of concern in essential defense programs is, however, not the major emergency concern of conservationists. They fear most the forces and interests that are always ready to take advantage of any diversion of public attention from their own selfish attempts to exploit natural resources without regard for the public interest. To meet this danger the Fish and Wildlife Service has attempted to keep the public informed. By means of the press, the radio, and public addresses, it has emphasized that conservationists, if alert, can prevent selfish actions, even those that might be disguised as "defense." This publicity, aided by similar efforts of others, has stimulated an interest that is producing results, and it is believed that a repetition of certain World War mistakes can be avoided.

Aside from activities concerned with national defense, and with the effective organization of a new service, the Department's work for fish and wildlife was largely a continuation of programs already under way and proving effective.

Consolidating two agencies (Bureau of Biological Survey and Bureau of Fisheries) that both began as research units more than half a century ago, and that continued to be scientific bureaus with action programs dependent upon their investigations, the new Fish and Wildlife Service is fundamentally a fact-finding agency. The major policy governing all of its operations is to consider the needs of wildlife first, and the effectiveness of this policy is wholly dependent upon an understanding of what these needs are. Knowledge of resources had been remarkably advanced by the Bureau of Fisheries and the Bureau of Biological Survey, but conditions are constantly changing and new circumstances arising, so that it is essential to continue and expand the research activities—not only to maintain an understanding of the current needs, but also to benefit by the new discoveries and the added knowledge inevitable in this field of ecology.

The report of the Director of this Service for the year is replete with instances of research activities. Many of them deal with fundamental problems in connection with the life history and habits of fishes, birds, and mammals, and their relationships to management policies. Advances in the field of fish pathology, for example, include the isolation of a previously unknown species of fungus that infects small fingerling trout. Haddock investigations indicated that the annual yield could be increased by at least 100,000,000 pounds by avoiding the capture of small and sexually immature fishes and allowing them an additional year or two of growth.

Other investigations are concerned with practical measures for dealing with specific wildlife problems. Rat control, for instance, important in both civil and military life, is in large measure dependent upon red-squill poison for use in baits, but as the international situation has cut this country off from its usual Mediterranean source of supply, service scientists have developed a practical method for the fortification of the low-grade squill that is still available. Regulations covering the take of migratory game birds and of Alaska fishes and game require field investigations to determine their suitability, and in many other ways the Department must rely upon investigations to insure prudent handling of fish and wildlife problems.

Statistical summaries, as important in wildlife conservation as in other activities, were compiled by the Fish and Wildlife Service, both as a guide for its own programs and as essential information for other agencies and the public. A survey for 1939, the latest year for which complete figures are available, shows, for example, that the fishermen of the United States and Alaska took 4,443,000,000 pounds of fishery products. Based upon these statistics, it was estimated that a 46 percent increase in this valuable food supply could be realized over a period of years and that, under conditions of wartime emergency, the yield could be increased to 4,628,000,000 pounds almost immediately and to 6,200,000,000 pounds in the next few years.

An annual waterfowl inventory, which revealed a continental population estimated at 70,000,000, or only about 5,000,000 more than the previous year, indicated that the take by hunters during the preceding season had approached the year's production—an indication of obvious importance in considering future regulations. An inventory by States of big-game animals in the United States showed that, out of a total of about 5,850,000, more than 5,275,000 were deer, and that most of the others were on Federal lands.

The importance of statistical information is emphasized by the lack of authentic data of the fur resources which prevents, for example, accurate estimates of the numbers and origin of animals trapped, thus interfering with the formulation of convincing recommendations. Availability and lack of basic information have thus both continued to emphasize the importance of investigational work in fish and wildlife management.

Using the results of such investigational work, the Fish and Wildlife Service has successfully continued the so-called action programs for which it is responsible.

The number of national wildlife refuges under the jurisdiction of the Service was increased by 4 (Havasu Lake, and Imperial, Ariz., and Calif.; San Andres, N. Mex.; and Thief Valley, Oreg.) and now totals 267, with an area of 13,740,304 acres. The work of improving the refuges to make them as attractive as possible to the wildlife for which

they were established was continued through the use of CCC, WPA, and NYA labor, and has advanced to a point where the program is showing definite results in increased use of refuges by wildlife.

The number of fingerlings and fry distributed from Federal hatcheries increased, although the total production of fish and fish eggs from the hatcheries decreased as a result of limited plants of fertilized eggs of three marine species off New England.

The \$2,500,000 appropriation for Federal aid in wildlife restoration was \$1,000,000 more than for 1940, and the number of States eligible for participation in the program increased from 43 to 46.

Enforcement of Federal laws protecting wildlife continued to increase in effectiveness. Control of predatory animals and injurious rodents through organized cooperative effort continued to be a significant activity of the Service.

The management of the game and fish resources in Alaska, for which the Fish and Wildlife Service has administrative responsibility, continued to make substantial the hope that mistakes of exploitation in the States can be avoided in this Territory.

In general, throughout the United States and Alaska, it can be asserted that wildlife is in a better condition than at the beginning of the year.

Geological Survey

Within the general scope of its authorized investigations in scientific and engineering fields, the Geological Survey placed growing emphasis on those phases that contribute most to national defense and, with somewhat increased funds, was able to make correspondingly larger progress. For example, in geologic and related investigations even greater attention was paid to the search for strategic minerals. These minerals, so essential in defense, but of which our domestic supplies are inadequate in quantity or in grade, include manganese, antimony, quicksilver, chromite, and others. During the year more than 150 examinations of deposits were made in a number of States, in Alaska, and in several of the other American Republics, and brief reports were published on a number of these special strategic-minerals projects. Consultant service was rendered to national-defense organizations and other Government bureaus and to the general public.

More than 28,000 square miles in the United States were covered by topographic surveys during the year, an increase of more than 3,000 square miles above that covered in the preceding year. This work was conducted under a direct appropriation; under cooperative funds made available by 17 States, Puerto Rico, and the Tennessee Valley Authority; and under a special fund appropriated to the War Department for transfer to the Geological Survey for mapping strategic areas selected by the Secretary of War. Among other national

defense activities, an unusually large amount of control-survey information was furnished to the War Department. Further successful use was made of stereophotogrammetric equipment for mapping by means of airplane photographs, and in the latter part of the year much additional equipment and technical personnel were being obtained for large expansion in the use of these methods.

The orderly and wise use and development of the Nation's water supplies, at all times important for the people's welfare, become an especially urgent problem in times of national emergency. Growth of defense plants and industries, construction of large defense works and training camps, and the concentration of large bodies of men at new points bring unprecedented demands for water, hence an acute need for expert determination as to whether existing supplies are adequate and whether new or additional supplies can be made available.

During the year the Geological Survey responded to hundreds of requests for information and advice on problems of this nature, in assistance to the War Department, to other Federal defense agencies, to State officers, to defense industries, and others. In so doing, it drew upon its store of information on the water resources of the country gathered painstakingly through more than half a century, and as need arose it made special field and laboratory studies. Its regular program, conducted in cooperation with virtually all of the States and with a number of Federal agencies, included the measurement of streams at nearly 5,000 gaging stations, many investigations of ground-water supplies, the gaging of water levels in many wells, and the analysis of more than 12,000 samples of surface and underground waters with reference to silt content or to suitability for industrial, agricultural, or domestic use.

Conservation and national defense were aided by the activities of the Geological Survey on the public lands. Examination and classification of those lands with respect to their mineral deposits and their water and power resources furnishes information that leads to their wisest use; and supervision of private mineral development on public and Indian lands, under the leasing laws, protects the Nation's properties and insures efficient operation and standards of conservation that serve as examples for the mineral industry. During the year the Geological Survey made more than 8,100 reports upon mineral resources, water power, or storage possibilities of public lands, at the same time safeguarding the Government's ownership of great reserves of coal, oil, gas, potash, phosphate, and other minerals.

Technical supervision was given to more than 5,200 properties containing oil and gas, more than 500 containing coal, and more than 100 containing other minerals. On Indian lands more than 4,100 oil and gas leases were supervised, in addition to more than 200 properties

containing coal and other minerals. Minerals produced during the year from public and Indian lands and naval petroleum reserves under supervision of the Geological Survey, had an estimated value of \$71,000,000 and revenue received by the Government as a result of this production amounted to about \$7,000,000.

Office of Indian Affairs

In no place, either in the Americas or in the Colonial Governments, has the problem of administering native minority groups been successfully defined in terms of democracy at work.

Although a small minority in this country, the Indians are significant because they represent in a way a conquered race. Once the proud possessors of this continent, the Indians fought with such death-like tenacity to save their homes that only today are we coming to realize what freedom and liberty must have meant to them.

Out of their struggles there grew certain democratic traditions which are alive even now. It is, therefore, important to note how this Government's policy in recent years has nurtured those traditions and accorded to the Indians the formal recognition so long denied them.

There are only 400,000 Indians in this country, equal to the population of Kansas City, Mo., but in all the Americas there are 30 million full-blood Indians. If not disinherited by wars, commercial exploitation or disease, these 30 million Indians of the Western Hemisphere represent a latent purchasing power which, if developed, might well help to stabilize western economy. It is important then that administrators and students of Indians in Latin-American countries, many of them faced with problems similar to those our Government has struggled with through several generations, should study and, perhaps, profit from the trial-and-error policies of Indian administration in the United States.

To analyze the past and plan for the future in defense of the Indian of the Western Hemisphere, a new division was set up within the past year in the Office of Indian Affairs. It is the Division of Inter-American Cooperation, serving as a clearing house for information and a medium for collaboration with other American Governments on Indian problems. Already the following countries, in addition to the United States, have acted to cooperate in this new Inter-American activity: Costa Rica, Cuba, Ecuador, El Salvador, Honduras, Mexico, Nicaragua, Panama, and Peru.

If the Indian's love of his homeland once proved an obstacle to the white man, today it is making an unique contribution, as it did in the last World War, to the total national defense effort. Speaking little known native languages, yet schooled in modern mechanical

arts, often in the radio and wireless, and thoroughly at home in the forests and in the desert and mountainous terrain of our rural West, the Indian possesses many skills valuable to a modern mechanized army of movement.

Within a few months after the Nation's defense needs became known, hundreds of Indians voluntarily enlisted for 3 years' service in the Army, and hundreds more embarked for army camps with their National Guard units. By July 1941, almost 1 out of every 10 Indians of military age was in the armed forces.

While Indians themselves have with alacrity joined the armed forces, so has the Indian Service, with similar zeal, revamped its institutions during the past year to meet the emergency. In many parts of the sparsely settled West, the Indian Service offers the best available equipment, space, and personnel for defense training in the county or State. Federal Indian schools have opened wide their mechanical shops to State defense training authorities. The Indian CCC camps are cooperating with private industry to furnish men trained in many trades, notably that all-important skill in defense production, welding. A number of the licensed radio operators in the Army are Indians who received their training in the CCC telephone and radio schools held every year.

Indians have been found a ready source of labor in certain sparsely settled areas where Army buildings have been under construction during the past year. At a multimillion-dollar ordnance depot for storing munitions in New Mexico, some 1,500 Navajos are employed tying steel, building forms, finishing cement, driving trucks, and bossing gangs.

Army officers and private contractors alike have been amazed to find Indians so adept in modern construction methods. This alone seems to justify the many emergency work projects undertaken on Indian reservations during the past 8 years, even though our first concern rightly has been to provide jobs for thousands of Indians threatened with starvation.

A nation organized in its own defense turns to its physical resources. In 1941 the resources of the Indian country, because of the past national effort toward conservation, were ready to meet the demands of the international crisis. True, the enormous abuses of the past have not yet been completely repaired, but Indian lands are healthier today than in any time in the last 20 years, and the heaviest rains in years in the Southwest this past spring helped to root semidesert lands in many growing things.

The Indians possess farming lands almost equivalent in area to the State of New Jersey. Their grazing lands would cover the States of Maine and Vermont and a quarter of Massachusetts. Their timber and woodlands would embrace the State of West Virginia. Oil,

mining, and power interests on Indian lands represent billions of energy units.

Because every unit of soil and water adds so much strength to the Nation's power, the sustained use of these resources continues as in preceding years. Indian workers are planting grasses and trees in barren areas to prevent wind and flood erosion. Timber is selectively cut, and new seedlings are set forth. Wise range management practices to conserve the grazing lands, plus artificial insemination to produce quality livestock, are bringing stock-raising to the front as a major Indian enterprise.

Indians themselves are found through all the ranks of the Indian Service. The Indian Reorganization Act of 1934 gave qualified Indians preference for jobs. Since 1934, the number of Indians employed has steadily increased until by October 1940, more than 5,000 Indian employees represented 60 percent of the regular staff. In addition, more than 11,000 Indians were enrolled in the Indian CCC or held temporary jobs in the Service. These Indians are members of 130 different tribes. They hold jobs in every branch of the Service, from the most routine to highly supervisory positions.

Lack of foreign imports, due to the war, has fastened America's attention on its truly native arts and crafts. Stimulated by exhibits at the San Francisco International Exposition and during the past year at the Museum of Modern Art in New York City, the public is increasingly aware that Indian art is not only beautiful but useful in a thousand different ways. The creation by hand of jewelry, woolen cloth, pottery, furniture, baskets, pocketbooks, tailored garments, and many other items of dress and housefurnishings, which cannot be duplicated on a mass-production basis, brings the Indians and America to a place of leadership in the world of art.

Indian crafts-men and women find that their most remunerative orders come through tribal craft organizations. The Indian Arts and Crafts Board, responsible in part for raising the level of craft work, is cooperating with local groups to expand these craft organizations in order to meet the increasing new outlets for goods.

Division of Territories and Island Possessions

As the world conflagration spreads, the territories and island possessions of the United States—the outposts of defense of the Western Hemisphere—take on an increasing importance in their relation to civilization's problems. The impact of the defense problems upon the territories is set forth in the annual reports of the four governors.

East of the great Panama Canal, strong naval and aerial fortifications have been and are being built on the islands of Puerto Rico and on the Virgin Islands.

Hawaii, already one of our strongest naval bases, has been greatly strengthened.

Alaska, now close and getting closer daily to the battlefields of the Far East, is the scene of increasing activity as national leaders have recognized the possibilities of attack from that direction.

The Philippine Islands stand between the United States and the expansion of any aggressor to the South.

While the Department is playing a strong part in coordinating the various governmental units as they extend and intensify their defense work, it is vitally concerned with assisting these far lands to attain more of the democratic way of life which has been achieved in the United States. This work is handled through the Division of Territories and Island Possessions in Washington.

On July 24, 1941, Guy J. Swope, Governor of Puerto Rico, was appointed Director of the Division, succeeding Dr. Rupert Emerson, resigned.

Alaska

As a direct aid to the military defense of this area, the War and Navy Departments and the Civil Aeronautics Administration have undertaken vast projects.

Prospects for the betterment of the economic welfare of the Territory were never more promising, notwithstanding slightly reduced revenues from fisheries and wildlife.

Hawaii

The coming of thousands of defense workers from the mainland, coupled with the great increase in Army and Navy personnel, highway traffic and adequate housing have become urgent problems with the civilian community of this Territory.

Defense projects throughout the islands, particularly the island of Oahu, are under speedy construction.

Puerto Rico

Due in part to the national defense program, Puerto Rico is enjoying a period of unprecedented prosperity. The island's unemployment problem has virtually disappeared, and the finances of the insular government are in sound condition.

During the year, hearings were conducted in connection with the enforcement of the agricultural restriction law passed by joint resolution of Congress in 1900. As a special adviser to this Department, Dr. Rexford Guy Tugwell was appointed to the work. Because of his more recent selection by yourself as Governor he will be able to carry this task forward.

Virgin Islands

A broader economic life has followed in the wake of intensive defense activities.

Not only have the various defense and WPA projects taken all employable males, but hundreds of workers have been imported to St. Thomas from neighboring islands, thus adding to the housing, health, and transportation problems of the community.

Philippine Islands

Supervision of the exportation from the islands of defense materials, as provided by Congress in the Export Control Act, has brought about an even greater measure of cooperation between Commonwealth officials and the Federal Government.

The war has to a large extent resulted in a reduction of the normal foreign trade of the Philippines with countries other than the United States, and even this is being seriously handicapped by a shortage of shipping facilities.

This Department is conscious of the danger of distress arising from such a situation, and is making every effort to forestall the possibilities of social disturbances.

Equatorial Islands

Strategically important stepping stones for the advancement of American aviation in the Pacific are provided by five small islands under the jurisdiction of the Division. Canton Island, in the South Pacific, administered in cooperation with the British, today is affording a vital stop-over fueling point for the trans-Pacific clippers, while Jarvis, Howland, Baker, and Enderbury Islands in the same region have been equipped to serve as effective outposts for the study of meteorological conditions and weather observations essential to safe air travel over the ocean.

National Park Service

The National Park Service celebrated the completion of its twenty-fifth ("silver jubilee") year as a Bureau in the Department of the Interior by reporting a new all-time record of park use by American citizens. Over 21 million persons used the parks in the travel year ending October 1, 1941.

After a quarter of a century of service, the Bureau continues to apply those policies and concepts of the proper use of lands and resources which have successfully guided it since the establishment of Yellowstone National Park in 1872.

During the year just passed the areas under the Service's supervision increased from 161 to 164 with the establishment of three national historic sites: Jefferson National Expansion Memorial in St. Louis, Mo.; Vanderbilt Mansion National Historic Site, near Hyde Park, N. Y.; and Fort Raleigh National Historic Site on Roanoke Island just off the North Carolina mainland.

The boundaries of several areas were enlarged and important progress was made on a number of land projects. The Federal park system increased from 21,550,782 acres on June 30, 1940, to 21,609,289.63 acres on June 30, 1941. The 164 areas in the system consist of 26 national parks, 82 national monuments, 4 national historical parks, 11 national military parks, 7 national battlefield sites, 8 national historic sites, 1 national recreational area, 9 national memorials, 12 national cemeteries, 3 national parkways, and the National Capital Parks in the District of Columbia.

In the Nation's defense efforts, the Service has become active as a builder of morale among civilians and men in the armed forces. A resolution adopted by the Advisory Board on National Parks, Historic Sites, Buildings, and Monuments states that "the Service's interpretive program in national park areas, particularly in the historic parks and monuments and the great scenic areas, is one of the most valuable contributions by any Federal agency in promoting patriotism, in sustaining morale, and understanding of the fundamental principles of American democracy and inspiring love of country."

Physical contributions to defense have been made in the planning and development of "rest camps" for soldiers and sailors. At the request of the War Department, the Service assigned representatives to work with the Army in each of its nine corps areas to provide recreation spots where from 500 to 2,000 men might go to spend week ends near towns and cities away from the routine of the military and naval stations. By the end of the year, rest camps had been established along the Gulf and Atlantic coasts and had been planned for all sections of the country.

The Service has assisted the Navy in the study of foundation engineering and soil mechanics. The Morale Division of the Army has been provided with detailed maps and information on the Nation's recreational areas. Important contributions have been made to the Engineering Defense Training Program of the Office of Education. Permission has been granted for the establishment of military and naval observation stations in areas under the Service's supervision and for Army units to maneuver over historic battlegrounds to lend realism. The Service has insisted that none of these defense activities harms the areas involved.

On Labor Day, 1940, you dedicated the Great Smoky Mountains

National Park in North Carolina and Tennessee from a speakers' stand at the memorial to the founders of the park in Newfound Gap on the State line. Among those at the dedication was Arno B. Cammerer, the former Director of the Service, who has since died. Mr. Cammerer's presence marked a proper rounding out of his efforts in pushing through the establishment of this great mountain park.

A nonprofit distributing corporation known as National Park Concessions, Inc., was established under the direction of the Secretary of the Interior to operate the concession facilities owned by the Federal Government at Mammoth Cave National Park in Kentucky. The idea back of this new method of furnishing accommodations for park visitors is that the Government should control and operate national park facilities wherever possible.

Construction progressed along the Blue Ridge and Natchez Trace Parkways. On the Blue Ridge Parkway, over 300 of the ultimate 485 miles in its length have been completed or are under construction. From Adney Gap, near Roanoke, Va., to Deep Gap, near Blowing Rock, N. C., there is a continuous 140-mile paved section over which 750,000 persons traveled during the year. On the Natchez Trace Parkway, 106 miles were reported completed or under construction in Tennessee and Mississippi.

The Service assisted in investigating, surveying, studying, planning, and reporting on the recreational possibilities of a number of reservoir projects. A land-use plan for the Bureau of Reclamation reservoir back of Coulee Dam on the Columbia River is perhaps the most important of these projects. An interdepartmental project was the Service's assistance in landscaping Alcatraz Penitentiary in cooperation with the Bureau of Prisons.

Winter sports activities, particularly skiing, have attained such proportions that future national park planning may be affected. At Mount Rainier National Park in Washington and Yosemite National Park in California, the wintertime enthusiasts came in throngs. During the last winter season 136,220 visitors went to Mount Rainier.

The Park, Parkway, and Recreational Area Study was continued as State-wide reports for park and recreation programs for Arizona, Delaware, Maryland, and North Carolina were completed, bringing the total to 34 States. A regional study of the natural resources of the Tennessee and Cumberland River watersheds and the surrounding area affected by them made good progress, and a similar study was planned for New England.

On 190 State, county, and metropolitan parks, 90 national parks and monuments, 22 recreational demonstration areas, and 2 military areas, the Service operated an average of 304 Civilian Conservation Corps camps. CCC defense projects under the Service's supervision included construction of Army "rest camps" and 5 airfields. Camps

were moved out of 30 areas on which development had reached a stage sufficient to meet essential requirements of the using public. On 13 areas, camps were established for the first time.

Dr. Thomas Barbour, Director of Harvard University Museum and its Museum of Comparative Zoology, was appointed to fill the vacancy on the Advisory Board on National Parks, Historic Sites, Buildings, and Monuments created by the resignation of Dr. Hermon C. Bumpus, the Board's chairman. Charles G. Sauers, general superintendent of the Forest Preserve District of Cook County, Ill., was appointed to fill another vacancy, created by the death of Maj. Gist Blair, of Washington, D. C.

General Land Office

Problems of national defense, involving the remaining unappropriated and unreserved portions of the public domain placed increasing responsibilities upon the General Land Office during the past fiscal year, particularly with regard to the need for new supplies of strategic minerals, power, and grazing facilities, and the military and naval requirements for large areas for aerial bombing ranges, antiaircraft ranges, combat training fields, and artillery practice grounds.

During the year, withdrawals of public land for use in connection with the national-defense program aggregated approximately 6,250,000 acres. These withdrawals included 6,209,932 acres for the Army, 4,509 for the Navy, and 9,983 for the Civil Aeronautics Administration.

Notwithstanding the additional burdens incident to national defense, the General Land Office maintained its position as one of the few agencies of the Federal Government whose operations result in a cash profit to the American taxpayer. Total cash receipts from all sources during the year amounted to \$7,732,341.93. This was more than three times the amount of the expenditures (\$2,116,078) and made the fifth consecutive year in which the receipts were in excess of \$7,000,000.

The cadastral engineering activities incident to defense and the national conservation program resulted in surveys and resurveys in the field covering 4,851,336 acres, or approximately 7,580 square miles.

More than 8,000,000 additional acres of land were assured the benefits of your wise conservation policies through the closing out, during the fiscal year, of all claims to portions of the public domain under early railroad land grants. Made possible by Congress through an amendment to the Transportation Act of 1940 affording opportunity for the institution of higher rates on certain forms of Government passenger and freight traffic upon the relinquishment by the carriers of all claims to public lands, restoration of these lands to

Federal ownership entailed a full year of investigation by research experts. Altogether, more than 70 land-grant claim releases presented by the carriers were submitted to me for approval in accordance with the provisions of the Transportation Act.

The release of these lands to Federal ownership signalized the close of a 90-year era in which the granting of vast tracts of the public domain as an aid to railroad construction was a fundamental policy of the Nation. Inaugurated by the Congress in 1850, with the allocation of 2,595,000 acres of the public lands for the construction of the Illinois Central Railroad, the development grew rapidly throughout the West until more than 75 grants, aggregating 158,293,000 acres, had been made.

While out of this policy grew the 21,500 miles of trackage which today form part of the transcontinental transportation network of the United States, the thoughtful student of Government well may ponder the even wider national benefits which might have accrued had the present-day standards of prudent conservation been in operation during the period.

Supervision, under the mineral leasing laws, of substantial deposits of coal, oil and gas, oil shale, potash, sodium, phosphate, and sulphur, constituted another phase of General Land Office activities during the year. It is estimated that 700 billion tons of coal (including lignite) or about 20 percent of the total coal resources of the United States, are in the public lands, including land to which the Government has parted only with surface title, while almost 5,000,000 acres of the public domain are under oil withdrawal. Between 7 and 8 percent of the Nation's known oil resources are estimated to be on Federal lands.

Great quantities of Douglas fir and other valuable timber on 2,500,000 acres of revested and reconveyed Oregon and California grant lands in western Oregon, are now under the jurisdiction of the General Land Office for development. Sound conservation principles insure a permanent supply of timber to communities dependent upon those resources for their economic existence.

With the transition from early policies of public-land disposal, to meet the cost of government, to protection of the remaining areas for the conservation of the Nation's natural resources, the General Land Office has been charged with important land-management responsibilities. For example, it administers the Mineral Leasing Act. It grants rights-of-way for public utilities and power and communication lines and oil and gas pipe lines. It administers the Oregon and California revested and reconveyed grant lands, and what is known as the 5-acre Tract Act. It also leases the lands of Alaska for grazing and fur farming, and is charged with the responsibility for fire protection for public lands in Alaska. More than 90 percent of the area

of Alaska is public domain under the jurisdiction of the General Land Office.

Basic to the proper management of the public domain and to the judicious utilization of its natural resources is a complete and continuous inventory of lands held by the Federal Government. To this end a Federal land inventory project, sponsored by the General Land Office, was continued throughout the fiscal year. When completed, the project will fill a long-felt need by making available, in a single office, information that cannot now be obtained without checking through the records of approximately 35 agencies having Government-owned land under their jurisdiction.

A new edition of the Official Map of the United States, revised to include many new outstanding defense and conservation areas, was brought to completion during the fiscal year. Preparation of this map has been the responsibility of the General Land Office since its first issue in 1880 was made by specific direction of the Congress.

Grazing Service

The Taylor Grazing Act of 1934 was designed to protect and improve the resources of the public range and to stabilize the livestock industry for the benefit of both local and national economy. World events of the past year focused the need for greater effort on the part of all concerned to meet the tasks that lie ahead.

To this end the Grazing Service extended its efforts in all directions during the past fiscal year to obtain from the Federal range maximum production of food and fiber while at the same time preserving the basic resources from which an important share of these commodities is obtained.

About 50 percent of the sheep and nearly 20 percent of the cattle produced in the United States, use the Federal range during part, at least, of their growing period.

We know now how seriously the conquered countries and the aggressor nations have had to cut into their basic food-producing resources. The cattle herds in many countries are virtually wiped out. The slaughter of foundation livestock in the occupied countries in Europe eventually will cause the world to look more and more to the United States as a source of breeding stock. Wise use, management, and conservation of the Federal range will enable our western livestock operators to contribute their share to world reconstruction after the war.

While the struggle in Europe is primarily one between dictator and democratic forms of government, there is beneath it all a struggle for the control of resources. The manner in which we utilize and manage the Federal range is a vital factor in America's future, and is of

immediate importance in the supply lines for the factory, the assembly line, the training camp, and human nutrition everywhere.

The public domain ranges must be handled so as to assure forage for livestock. At the same time the mistakes of overstocking made during the first World War must not be repeated. This means that the 142,000,000 acres set aside for grazing control under the Taylor Grazing Act must be used wisely and efficiently. It means defense against waste of soil, water, and forage to safeguard investments in education, irrigation, power, livestock, and other enterprises. It means rebuilding in some areas and adjustment of uses in others. It means local and national planning in terms of present and future needs. It means that we must center our efforts around range problems in relation to our established livestock economy, keeping in mind the unusual demands on the range to meet requirements.

To assist in the plan to create more office space in Washington for direct defense activities, the Grazing Service headquarters was transferred to Salt Lake City, Utah, on June 19, effective August 1, 1941. Salt Lake City is at the geographical hub of grazing-district activities in the West. From the standpoint of the problems involved, this transfer will effect closer cooperation between the stockmen who use the public range and the Grazing Service in conducting its program on the ground. It will help the stockmen and the administration do a better, more profitable job and will assure further productivity of the range. Closer contact with the people and their problems occasioned by this move should solidify the policy of "home rule on the range."

Following the Civil War, the public domain was the frontier for new homes and the reservoir of boundless resources for a growing nation. Today the public lands are playing an entirely new role on a new frontier. Today the need for areas in which to prepare for modern-day defense has focused national attention on the public domain as a proving ground for our air forces. During the year the Grazing Service cooperated with the War Department in the establishment of bombing ranges, rifle ranges, aerial combat ranges, aerial combat training grounds, maneuver areas, air-navigation sites, and munitions dumps, involving about 5,000,000 acres of public land (about five times the area of Trinidad) in Nevada, Arizona, New Mexico, Utah, and Oregon. The stockmen affected and other local citizens cooperated to the fullest extent by making adjustments of range use in order that the expanded air-training program could proceed on schedule. Special-use areas were recommended by the Grazing Service for community, State, and Federal needs in grazing districts under the 5-acre lease law for civilian target ranges, travel check stations, storage sites for Federal agencies, and administrative sites to coordinate unusual activities resulting from the defense effort.

Seven years ago the great "grazing commons" of the West were put under Federal supervision by the Taylor Grazing Act. In that time the principal arterial routes of administration have been laid out and many laterals finger out from them. However, unnumbered trails, as yet uncharted, remain to be blazed.

Progress would have been slow without the cooperation of the stockmen and the local advisory boards. This type of citizen cooperation has joined the forces of range users and administrative men in a mutual conservation effort that radiates throughout the arid West. A total of 582 district advisers assisted with the program during the year.

The action program of the Service was enlarged substantially by the establishment of additional grazing districts; by the assumption of added duties conforming to cooperative arrangements with various bureaus of the Department; and by expanded soil- and moisture-conservation activities prescribed in the Reorganization Plan No. IV.

The establishment of four additional grazing districts during the year brought the total number of grazing districts to 57, covering a gross area of 266,006,200 acres in 10 States.

Fifty orders of modification were approved, resulting in the addition of about 3,000,000 acres of land to grazing district areas and the elimination of approximately 250,000 acres for air-navigation sites, reclamation projects, canalization projects, wildlife, recreational, and Indian needs. Fifteen thousand acres of stock driveway withdrawals were revoked and the land placed under grazing district administration.

The area of public land administered by the Grazing Service during the year totaled 144,873,200 acres. Approximately 8,535,000 acres of this total are included in public withdrawals for power, reclamation, naval oil stores, and other areas held in reserve for future public needs. Thus, lands in grazing districts withdrawn for other purposes, are beneficially used and conserved pending the time when they will be put to the uses for which they were specifically set aside.

Long-term grazing permits to replace temporary licenses of previous years were made ready for issuance to approximately 60 percent of the operators. The number of licensees and permittees was increased by 934 (about 5 percent) over the previous year. On the other hand, the total number of livestock was 851,727 head less than the number that grazed the ranges during the previous year. In some measure, this was due to temporary elimination of grazing on depleted areas, but for the most part it was due to the fact that many stockmen took advantage of prevailing favorable prices and disposed of surplus livestock. In some areas there was a shift toward more cattle and less sheep. Licenses and permits were issued during the year to 21,543 stockmen for 11,079,237 livestock in 56 grazing districts.

Soil and moisture conservation work entailed in the Reorganization

Plan No. IV, was initiated on 46 projects, affecting 5,530,000 acres in the 10 States.

The conservation of soil and water basically expresses the underlying objective of any land-management program and the allotment of specific funds in 1941 for this purpose enabled the Grazing Service greatly to expand such activities, resulting in definite benefits for the public lands.

Better weights of animals and fleeces were reported from all parts of the Federal range territory. Control of the resources, coupled with orderly handling of stock enabled range users to produce more of the essential livestock commodities despite the reduced numbers. There is a definite trend toward "more pounds" and away from "more numbers" with resultant benefits to the range and the livestock industry.

Office of Land Utilization

Because of the tremendous responsibilities entailed in the administration of the vast land areas under its jurisdiction, and the necessity for an all-inclusive coordinated approach to the land-management problems involved, the Office of Land Utilization was established and began to function during the latter part of the 1940 fiscal year as a unit in the Department. Immediately upon its organization, the Office of Land Utilization entered upon its duties of coordinating the functions and activities relating to land management and conservation work of all bureaus of the Department administering public lands.

The Office of Land Utilization was charged with the formulation and direction of an over-all and completely integrated program of land use, including forest management, and later of soil and moisture conservation as a result of Government Reorganization Plan No. IV. The Office has no operations division and none is planned since field programs have been and will continue to be carried out by the several land-management bureaus and agencies of the Department.

It should be pointed out in this connection that the idea of a coordinated approach to public land-management problems was not new in the Department. Since July 1, 1939, when the Office of Director of Forests was created, all forestry work has been carried out under a coordinated plan developed in cooperation with the agencies engaged in administering forest resources. The Office of the Director of Forests was logically the foundation around which the more all-inclusive Office of Land Utilization was built. Here the coordinated forestry program of the Department is conducted as before, except that it was greatly strengthened and implemented during the year by virtue of its important position in the much broader land-management program initiated for all Interior lands.

At the beginning of the 1941 fiscal year, the Department was given new and enlarged responsibilities. Section 6 of Reorganization Plan No. IV, transferred all soil and moisture conservation operations conducted by the Soil Conservation Service of the Department of Agriculture on Interior lands to the Department of the Interior.

In order to attain the aims and objectives of the reorganization as rapidly and efficiently as possible, the authority for the expenditure of funds received for soil and moisture conservation work on public lands was vested in the Office of Land Utilization. Likewise, all personnel engaged in carrying out the broad conservation field activities were attached directly to the Office of the Secretary and assigned by the Office of Land Utilization to the several action agencies.

The first major task faced by the Office of Land Utilization in connection with the reorganization was the conveyance in Washington and in the field of personnel, supplies, monies, and equipment involved. Effectuation of these details threw a heavy burden upon the very limited staff of the Office, and it was necessary to spend a large part of the first half of the fiscal year working out administrative problems, including matters of finance, property, and personnel. The personnel involved in the transfer consisted of 447 individuals, and the funds transferred amounted to \$2,302,500.

The conservation policy of the Department, as interpreted into an integrated master program during 1941 by the Office of Land Utilization, may be summarized in four principal points: (1) Sound present use and management of the public lands for the benefit of all the people; (2) practical administration that fits wise use of the land into the day-by-day economic problems of individuals, families, groups, and sections of the country directly dependent upon Federal land for a livelihood; (3) management of the land in such a way as to utilize its inherent productive capacity, while protecting its basic national economic value for the needs of future generations; (4) observance of democratic principles in the use and administration of the Federal Estate through cooperative application of the experience and knowledge of practical land users in devising and carrying out field operations.

A review of field activities conducted during the past year under the master conservation plans developed by the Office of Land Utilization in cooperation with the land-management bureaus, reveals that outstanding accomplishments were attained in the actual use of conservation practices and measures on wide areas of the public lands.

The Department during 1941 made outstanding contributions in the field of forestry by continuing to push forward the coordination of activities of the several units concerned with forest management. As in past years, special attention was given to making the management of the forest lands under its jurisdiction models of economy and good

business, and increasing the friendly cooperation with the public and private agencies with which the Department deals.

No phase of forestry administration is of greater interest and significance than is the financial report of the Oregon & California Revested Lands Administration. Now appropriately classified as a million-dollar forestry enterprise, the O & C Revested Lands Administration has the distinction of being the highest income producing field unit of any public forestry agency in the United States, the next highest being the Klamath Indian Reservation, also in Oregon.

During 1941 the total income from the sale of timber and forest products from O & C lands amounted to \$1,102,000, while the amount appropriated for administration was only \$170,000. This fiscal achievement is unparalleled in American forestry, and especially noteworthy is the fact that it was accomplished on the basis of permanent forest production and in conformity with the principle of sustained yield.

Indian forest timber continued to be handled on a commercial basis, and cutting is conducted by the highest-bidding qualified operators under the supervision of foresters of the Indian Service. During the fiscal year the cost of administration and protection of Indian forests was only \$555,640, while income from forest sales amounted to \$3,239,294.

There are approximately 23,000,000 acres of forests on the unreserved public domain and in the grazing districts. At present there is no legislation providing specifically for the management of the forest resources on these lands, nor have adequate funds been made available for their protection and development. On the other hand, these forests are taken into full consideration in the making of co-ordinated conservation and protection plans for Interior lands.

Among the most progressive undertakings in American forestry in recent years, which are being pushed forward by the Office of Land Utilization, is the development of cooperative sustained-yield forest units. In many localities throughout the United States, the ownership and jurisdiction of forest lands are so intermingled that it is highly impractical and uneconomical to attempt an application of the principle of sustained yield to each separate forest property or administrative unit. Extensive field studies and experiences indicate clearly that a practical and effective means of improving this complex forest-management situation is the formation and operation of cooperative sustained-yield units. While no such unit has been fully established as yet in the United States, several units soon will be ready for formal establishment and development.

Protection against fire continued to be one of the principal forestry activities carried on during the year by the National Park Service, Office of Indian Affairs, Grazing Service, and the O & C Revested

Lands Administration. Protective organizations did effective work in preventing and suppressing forest fires during the year.

While excellent fire protection work was accomplished on the vast acreage of forest lands in Alaska, it is necessary to point out that only \$27,000 was available for this work in 1941. During the year 197 fires were dealt with, but 83 fires were reported upon which no action was taken by the Alaskan Fire Control Service because of their inaccessibility and the very limited personnel that was available. Greatly increased funds for the proper protection of the forest resources of Alaska and for the development of an all-inclusive program of conservation development are needed if the Nation is to guard adequately the tremendous landed resources of the great empire to the North.

In addition to the progress made in coordinating and planning activities incident to getting the broad land-use and management program of the Department into active operation, the advisory services of the Office of Land Utilization were given on a large number of problems to the various agencies and subordinate units charged with a wide range of administrative responsibilities.

In its capacity as coordinator of land-use plans and programs, many appeals on land classifications submitted to the several land-management bureaus were referred to the Office of Land Utilization. All appeals of classification were considered in the light of the broad conservation policies and plans of the Department.

Regular and special meetings of the Land Committee of the National Resources Planning Board, of which the Assistant to the Secretary is a member, were attended. Several reports were prepared and other assistance given to this important national committee.

It is significant that in the administration of public lands under its jurisdiction during this year of rapid transition from a peace-time economy to a period of unlimited national emergency, the Department was able to make important contributions to the national defense program while maintaining and increasing the conservation gains of the past 8 years. In contrast to the waste and exploitation of public-land forests and the misuse and overuse of range lands during the World War, the public lands today are managed so as to fill all normal needs and accept the challenge for increased use of Federal land resources in the interest of national defense without disturbing the sound management policies under which they are handled.

The tremendous forest and land resources under the management of the Department are so located that they are making immediate and substantial contributions to the national defense program. From the great protected forests and the vast range lands is coming a steady stream of timber, food, and other products to contribute and give impetus to the all-out national preparedness endeavors.

Conservation of the resources of the public land goes far beyond the protection of the physical property. The Department is ever on the alert to defend conservation laws and policies against attempted break-throughs for quick war profits. A guard is constantly held against efforts designed as patriotic enterprises for the use of natural resources, but which in reality are destructive of all conservation principles and represent attempts to "blitzkrieg" conservation fortifications in the interest of personal gain.

In addition to meeting all present conservation requirements, the Office of Land Utilization is already making plans and devising programs for a greatly expanded management and conservation-development program for the public lands at the end of the present emergency period. Such a program may be the springboard from which one segment of public-works employment can be launched to help take the shock out of the inevitable transition.

Division of Investigations

The Division of Investigations during the fiscal year 1940-41 gave preferred attention to investigations for the various bureaus and offices of the Department whose activities contributed to the facilitation of national defense and the continuation of the program for conservation of the resources on the public domain.

For example, preceding the establishment of the reserve on the Mojave Desert in California for use as an antiaircraft practice range by the War Department, special agents of this Division made a general examination of the land. Later, negotiations required to clear title to the area resulted in the checking of thousands of mining claim records and the examination of approximately 900,000 acres of land.

Among the outstanding contributions of this Division to the national defense through conservation has been the part it has played in the program to protect and promote proper use of grazing lands on the public domain. During the fiscal year reports were submitted on 2,905 applications for grazing leases.

The Division also investigated conditions surrounding the poisoning of livestock on lands in northern Nevada, alleged to have been the result of arsenic fumes emanating from an ore reduction plant erected by a mining company. The investigation developed that livestock was being poisoned by the fumes, and the company arranged to remedy the condition.

During the year there were received 10,082 cases for investigation and reports were submitted in 19,043, the largest number of cases closed in any one fiscal year since the formation of the Division.

Petroleum Conservation Division

With petroleum and petroleum products becoming an ever-increasing factor in national defense, operations of the Petroleum Conservation Division assumed greater importance during 1941, as that agency prepared to enter its sixth year of enforcement responsibilities under the Connally Hot Oil Act of February 22, 1935.

Established to assist in the administration of Connally Act provisions calling for the regulation of interstate and foreign commerce of petroleum and its products produced in violation of State laws, success of the Division's work is indicated by the fact that on two occasions the legislative authority contained in the act has been extended by Congress. I strongly recommend that this legislation under which the Division operates be given permanent status.

The tender system, through which regulation under the act has been made effective, heretofore has been used only in the East Texas oil field, but the area from which monthly reports of operations of producers, refiners, and transporters of petroleum will be required, has been extended into other portions of Texas, into New Mexico, and Louisiana. At the same time, areas other than those designated in this order will be under constant supervision by examiners of the Division, and no crude petroleum or petroleum products are permitted legal shipment from coastal points of Texas and Louisiana without reporting to the Petroleum Conservation Division the field of origin and the State orders under which the oil moves.

During the fiscal year, approximately 14,500 shipments, and a like number of discharges, were reported to this Division.

Bituminous Coal Division

I am glad to report that stability has been brought to bituminous coal markets by the establishment of minimum prices and marketing rules and regulations under the Bituminous Coal Act of 1937, which is now administered through the Bituminous Coal Division. The minimum prices and marketing rules and regulations, which became effective on October 1, 1940, now provide this industry with a bulwark against the price cutting and unfair trade practices which had kept it in a state of upheaval for nearly 20 years and which led to passage of the Guffey Coal Act.

The sound basis of operation which the stability created by the coal act has provided for this basic industry is of great importance to the country during the present emergency. Industrial sinews, which were wasting away by long years of dissipation of capital assets by price wars, now are being rebuilt, and will be stronger to meet the task of supplying the vast energy resources we must have for defense.

The value of the Bituminous Coal Act as a national-defense measure is obvious in another way. Under this law, the forces of Government and industry have been welded into a harmonious, effective working organization which is getting results in attaining the law's objectives. A vast store of detailed information concerning the production, preparation, transportation, distribution, and use of the various kinds, qualities, and sizes of bituminous coal has been assembled and is being assembled currently by the Coal Division in the administration of this law. Such information, with the Division's trained staff of men experienced in coal, and the Bituminous Coal Producers' Boards, through which the industry's forces have been organized for cooperation with the Government, provide effective machinery to aid in handling coal supply and price problems.

During the summer of 1941, the coal industry has been enjoying the strongest market it has experienced for many years. Bituminous Coal Division economists have estimated that the industry's production will total approximately 500,000,000 tons for the calendar year of 1941. This would be the largest since 1929, when 535,000,000 tons were produced.

However, in 1941, during which the coal will have been sold under the protection of effective minimum prices and marketing rules and regulations, the industry is assured that its average earnings will not be less than approximately its average cost of doing business. By contrast, income-tax records show that in 1929, when the industry did not have the protection of the coal act, it suffered a net deficit of more than \$11,800,000.

Late in the summer of 1941, some concern was being shown by consumers regarding the market prices they were being charged for bituminous coal. The Office of Bituminous Coal Consumers' Counsel has filed a petition with the Bituminous Coal Division, requesting that a maximum price ceiling be placed on coal prices to protect the public from what he believed to be "excessive and oppressive" prices. The Coal Division called a hearing on this petition for September 9, 1941, in order that the matter might be inquired into as expeditiously as possible under the provisions of the coal act.

The Division is in the process of investigating also the effect which the new wage contracts entered into by mine owners and employees during 1941 has had upon the costs of producing coal, as the basis for making any appropriate changes in the minimum price structure.

I feel that the Nation has benefited from the operation of the Bituminous Coal Act so far, and I have reason to hope and expect that these benefits will be of long duration. When the present expanded market for coal which has been caused by the defense boom is deflated, the coal industry will have in the coal act protection against

sales below cost and unfair trade practices which become more prevalent during periods of more normal demand for coal.

It should be borne in mind that although much coal has been sold above the "cost floor" minimum prices, a great amount has been sold at the minimum prices since they were established on October 1, 1940. Despite improved coal markets, some producers have violated the Bituminous Coal Act by selling their coal below minimum prices or by engaging in practices prohibited under the law. Many investigations and prosecutions by the Division have resulted.

Office of the Solicitor

The steady increase in both the number and the difficulty of the legal problems presented for consideration which has been remarked in prior reports continued unabated throughout the fiscal year. The upward trends in the quantity and gravity of legal tasks were further intensified by reason of the added duties entailed in working out arrangements which would enable the enormous national defense values of the resources husbanded and protected under the conservation program to be drawn upon for the purpose of supplying vital national defense needs quickly and effectively.

The volume of legal work moving through the immediate office of the Solicitor aggregated 25,924 items during the year.

The preparation of formal and informal opinions upon points of law also necessitated increased attention. The number of formal opinions written increased from 367 in 1940 to 543 in 1941.

The legal staffs of the various bureaus of the Department also dealt with an increased volume of work incidental to the national defense and conservation problems confronting them.

Division of Personnel Supervision and Management

In addition to its normal duties during the past fiscal year, this Division geared itself to the new and urgent needs created by national defense and rendered greater assistance to the supervisors and administrators having these new tasks to perform. While the immediate problems of personnel have been given the right-of-way, long-range plans and programs have not been overlooked.

Considerable emphasis was placed on recruitment during the year, with particular reference to the specialized needs of the bureaus and offices engaged in defense work. The Division has been in close contact with the Civil Service Commission and has assisted in the preparation of announcements for examinations and in obtaining, through selective certification, the type of persons necessary to per-

form the duties in highly specialized positions. The Department's promotion-from-within policy has not been sacrificed, as the employees of the Department receive first consideration in the filling of all vacancies.

One noteworthy project of the training program within the Department started during the past year was the supervisors' forums, in which the heads of the various divisions in the Office of the Secretary formed a master session for the purpose of setting the style and cutting a pattern of programs of training in the technique of supervision. Another form of employee training which was satisfactorily begun during the year was that of conferences on specialized procedures, designed to bring about thorough and uniform application of laws and regulations.

At the close of June 30, 1941, there were 48,941 employees in the Department of the Interior. Of this number, 44,374 were in the field, and 3,567 located in Washington.

During the year, 543 employees were placed on furlough for military service.

Conclusion

Near the close of the fiscal year, you referred to this jurisdiction by Executive order the problem of maintaining adequate supplies of petroleum on the East coast. This assignment was so recent as to make detailed reference to it unnecessary. For the benefit of the record, however, it should be said that the assignment of American tankers to defense tasks created a serious problem of supplying the East coast with the necessary amount of petroleum to meet increased demands.

The Office of Petroleum Coordinator moved quickly to reshuffle the various means of transportation and to take such other precautionary steps as seemed wise to enable us to stretch available supplies to meet growing needs.

In October, when a number of tankers were returned from British service, it was found possible to lift the restrictions on petroleum consumption in the East which were necessarily imposed in August. The various steps taken by the Petroleum Coordinator's Office were followed by a reduction in the spring 9 million barrel deficiency in petroleum reserves on the East coast to one of less than one-half million barrels at the time the restrictions were lifted.

Further opportunity for this Department to render public service in the national emergency was afforded in your letter of November 5, requesting the Secretary of the Interior to act as solid fuels coordinator for national defense. Immediate steps were taken to comply with this request with the assistance of the technical staffs of the Bituminous Coal Division, the Bureau of Mines and the Geological Survey

to the end that a supply of solid fuels is readily available at consuming points when required for military, industrial, and civilian purposes.

While these two elements of national defense work were, strictly speaking, undertaken for the most part after the close of the fiscal year dealt with in this annual report, they are nonetheless well worthy of mention as indicative of the type of public service and programs of the Department of the Interior under present conditions.

Throughout the year all branches of Department activity have been focused on national preparedness and defense. Enthusiasm for the cause has run high. In developing greater defense assets, normal functions have taken on new importance. Today, more than ever before, every citizen has an interest in the Department of the Interior. The story of this interest and the increasing responsibilities of the Department is told in the full reports of the Bureaus and Offices which I now have the privilege of transmitting.

Very respectfully,

Harold L. Ickes

Secretary of the Interior.



JOHN C. PAGE, Commissioner

TODAY the Bureau of Reclamation is not only conserving water resources for the permanent development of the West but is also making important contributions to national defense and paving the way for meeting post-emergency requirements and future peace.

The multiple purpose program advanced during the fiscal year 1941 clearly reflects the many benefits realized from the construction of irrigation projects in 15 Western States. Great storage dams in addition to their primary purpose of irrigating thirsty lands serve also to generate low-cost power needed critically in the manufacture of airplanes and other defense equipment, in the production of aluminum, and in the processing of strategic and other minerals. Reclamation reservoirs impound water for irrigation of new lands and supplement the diminishing supplies for established agricultural areas, thus providing homes for destitute migrants sweeping westward and anchoring other farm families on lands threatened with desolation.

Reclamation projects assure food supplies for the western half of the country and opportunities for thousands of other families in nearby cities and towns. These projects are made up principally of family-sized farms—the backbone of the Nation's stability. They contribute to the purchasing power of the West, to the stabilization of the livestock industry and to the maintenance of a population growing at twice the national rate. Through them domestic and industrial water supplies are being assured, floods and soil erosion controlled, navigation improved, wildlife refuges maintained and recreation facilities provided.

Record Year for Reclamation Reservoirs

The West celebrated one of its finest water years in a generation. The 73 reservoirs in operation on Reclamation projects in 15 Western States on June 1 contained 41½ million acre-feet or 13,000 billion

gallons of water. The largest was Lake Mead at Boulder Dam on the Colorado River. Storage at Lake Mead on June 1 was 28,000,000 acre-feet and rose during June to more than 30,000,000 acre-feet, the largest amount ever impounded in the reservoir. All five reservoirs on the Salt River project spilled for the first time. Their storage had reached the maximum capacity of 1,894,800 acre-feet contrasted with 22,000 acre-feet last year.

Social and Economic Importance of Reclamation

With the expansion of its irrigation and power activities, the Bureau of Reclamation at the close of the fiscal year, was serving more than 4,700,000 persons—a population greater than that living in the 11 Mountain and Pacific States when the Reclamation law was enacted in 1902.

Settlement and economic data—1940

State	Project	Irrigated farms		Towns on or tributary to the project		Number of schools	Number of churches	Banks		
		Number	Population	Number	Population			Number	Deposits	Number of depositors
Arizona	Salt River	13, 158	43, 494	12	142, 506	96	156	7	\$69, 660, 284	25, 500
Arizona-California	Yuma	1, 812	3, 838	5	10, 957	13	27	1	² 1, 625, 175	² 2, 002
California	Orland	748	2, 051	1	1, 716	9	10	1	1, 024, 362	3, 051
Colorado	Grand Valley	526	1, 700	6	19, 900	17	38	3	4, 638, 445	19, 250
	Uncompahgre	1, 774	6, 289	3	9, 186	28	35	4	3, 527, 094	7, 170
Idaho	Boise	4, 050	16, 000	16	51, 228	118	130	4	(³)	(³)
	Minidoka	3, 540	13, 154	10	14, 625	35	72	6	(³)	(³)
	Upper Snake River	1, 540	3, 750	9	9, 633	24	31	3	(³)	(³)
Montana	Bitter Root	338	1, 669	7	4, 885	18	13	4	2, 122, 280	4, 780
	Frenchtown	35	150	2	130	2	1	0	0	0
	Huntley	631	1, 787	5	810	7	6	1	180, 797	250
	Milk River	678	2, 811	16	11, 752	30	38	7	4, 647, 693	7, 274
	Sun River	875	2, 567	5	1, 101	11	11	1	414, 812	800
Montana-North Dakota	Lower Yellowstone	702	2, 568	7	4, 305	18	22	2	1, 150, 400	2, 600
Nebraska-Wyoming	North Platte	3, 163	10, 207	17	27, 337	73	68	10	7, 591, 711	14, 166
Nevada	Humboldt	56	230	1	1, 294	4	4	1	992, 606	1, 300
	Newlands	729	2, 683	4	2, 298	16	12	1	946, 000	1, 555
	Truckee Storage	425	1, 800	2	26, 635	25	19	4	21, 268, 726	19, 674
New Mexico	Carlsbad	442	2, 068	4	10, 273	10	12	2	2, 145, 689	3, 400
New Mexico-Texas	Rio Grande	4, 112	29, 371	40	129, 865	88	128	6	42, 651, 106	36, 598
Oregon	Umatilla	500	1, 327	5	1, 755	7	12	1	⁴ 496, 765	1, 250
	Vale	517	1, 829	3	1, 282	8	14	1	482, 673	1, 500
Oregon-California	Klamath	929	3, 022	5	28, 698	30	35	5	(³)	(³)
Oregon-Idaho	Owyhee	1, 474	5, 695	5	6, 923	28	27	2	(³)	(³)
South Dakota	Belle Fourche	699	2, 237	5	3, 680	22	15	3	2, 320, 000	4, 750
Utah	Hyrum	516	1, 520	3	3, 730	5	5	0	0	0
	Moon Lake	722	2, 800	5	3, 311	15	23	1	484, 367	1, 738
	Ogden River	1, 079	4, 300	7	53, 048	33	60	4	30, 019, 271	29, 020
	Sanpete	257	1, 086	2	2, 933	7	6	1	504, 000	850
	Strawberry Valley	2, 000	8, 500	13	15, 603	26	30	4	2, 827, 476	6, 341
	Weber River	2, 100	10, 000	11	8, 795	26	20	7	(³)	(³)
Washington	Okanogan	382	961	4	5, 095	9	8	2	1, 364, 128	2, 812
	Yakima	5, 417	18, 812	24	48, 478	81	78	8	7, 221, 169	13, 673
Wyoming	Kendrick	0	0	7	19, 464	17	19	2	10, 361, 576	12, 000
	Riverton	465	1, 705	3	2, 704	4	14	1	631, 000	1, 200
	Shoshone	1, 050	2, 800	5	2, 199	3	9	1	606, 058	1, 500
Totals		57, 441	214, 781	279	688, 134	963	1, 208	111	221, 905, 663	226, 004

¹ Decrease due to transfer of suburban Phoenix population to "towns-population."

² Deposits for whole bank system; depositors in Yuma Branch only.

³ Data not reported.

⁴ Bank data for East division only.

On 36 Reclamation projects in operation for which detailed settlement and economic data are given on the accompanying table, there are 57,441 irrigated farms, on which there reside 214,781 persons. In 279 cities and towns created by or which are maintained by the project farms, there is a population of 688,134. More than 20,000 additional farms with a population of around 100,000 persons receive supplemental water supplies from project works.

Projects under way or authorized will enable the Bureau to extend its influence directly to nearly 10,000,000 persons in 16 States west of or bisected by the one hundredth meridian.

Property values created, maintained, or protected by the multiple-purpose developments now in operation, reach a total of \$5,600,000,000.

Completion of the program now being aggressively advanced to meet national defense needs in power, permanent industrial requirements, and the demand for homes in the rural areas will double the tangible wealth traceable to the national irrigation policy.

As revealed by actual surveys of typical areas, the purchasing power flowing from or sustained by Reclamation facilities extends throughout the Nation. Every State east of the Mississippi River shares in a home market worth a billion dollars annually to American manufacturers and farmers.

Many areas receive a double service as a result of Reclamation developments. Water stored in Boulder Dam and diverted at Parker Dam into the Colorado River Aqueduct of the Metropolitan Water District, completed this year as a municipal undertaking, is now available to supplement the domestic supplies for Los Angeles and 12 other cities of the metropolitan area of the Pacific Southwest. These same cities receive a large part of their power supply from Boulder Dam.

The cumulative value of crops produced on land watered by Reclamation projects since 1906 exceeds two and three-quarter billion dollars—an amount twice the estimated cost of the current Reclamation program. This amount turned into channels of national trade is conservatively estimated to have added nearly 18 billion dollars to the national wealth in 35 years.

More than 50,000 family-size farm homes have been carved from the desert. As many more will be provided by projects under construction to meet the growth in western population—twice the national average.

Originally conceived as a means of providing new opportunities for settlement in the West, the energies of the Bureau of Reclamation now are turned largely toward preserving established agricultural communities. More than 25,000 farm homes have been saved by supplemental water developments. When the present program is completed, 85,000 additional farms will be assured of permanency.

Thousands of farm homes will be saved in the Great Plains and other areas confronted by water shortages and disastrous dry-farming practices.

As each irrigated farm provides support for from two to three families in nearby cities and towns, the number directly benefited by irrigation developments, operating and planned, will be increased to nearly 500,000.

The taxable wealth created and maintained in the 15 Western States in which Reclamation projects are operating, contributes millions of dollars annually to the support of State and local governments. The ability of several hundred communities to remain self-supporting results from new settlement opportunities and sustained commercial enterprises.

Food supplies have been increased for an expanding population without invading the markets of other agricultural sections which produce such staples as wheat and corn. On the other hand, the West offers domestic outlet for the corn and hog products of other sections as well as for other crops not produced under irrigation.

The shipment of western agricultural products eastward, when farms near the eastern population centers are covered with snow, and the return loads of purchases, are a major support of the transcontinental railroads, the intercoastal steamship lines, and highway motor transports.

Hundreds of churches and schools reflect the social influence of the transformation of desert wastes into productive self-sustaining communities. The maintenance of thousands of these institutions in areas threatened with disastrous water shortages is an objective of a major phase of Reclamation.

Construction activities on Reclamation projects create employment in areas generally far distant from those centers of industry where national defense has spurred factory and shipyard production. The type of labor employed at the sites of construction is usually not in demand in industries.

Projects under construction will not only maintain the existing population in its present locations but will afford new opportunities for the settlement of migrant families from other areas. New land and adequate water supplies for established agricultural areas will assure farm homes for much of the industrial population in the West when defense industrial employment recedes.

The Bureau of Reclamation in 1940 was prepared to serve irrigation water to 4,168,168 acres—the largest area since its operations began. This area represents an increase of 278,628 acres over that reported for 1939.

The area within regular projects, receiving a full supply of water, was increased about 50,000 acres. The largest part of the additional

area was in the Payette division of the Boise project in Idaho. Facilities for supplying water to the Buffalo Rapids project in Montana were available for the first time.

The additional acreages, reported as receiving supplemental water supplies from storage projects, were located in the Upper Snake River project in Idaho, the Moon Lake project in Utah, the Pine River project in Colorado, and the Deschutes project in Oregon. The latter two areas received initial supplemental service this year.

There will be a material increase in the acreage served by Bureau projects during the 1941 season. The All-American Canal will substitute the water supply for the Imperial Valley in California, served for more than 35 years by a canal extending partly through Mexico. Eventually more than 1,000,000 acres will receive water from the All-American Canal System.

The crop returns from the 3,316,030 acres of land in cultivation actually irrigated in 1940 were valued at \$117,788,677, an increase of \$3,705,883 over the total for 1939. The average crop value per acre of \$35.52 was \$1.54 per acre less than the 1939 record.

Under the construction program now in progress, operations of the Bureau will be extended to about 2,370,000 acres of land to be brought into cultivation. The largest development in this program is the Columbia Basin project which will irrigate 1,200,000 acres

More than 3,800,000 acres of land now inadequately irrigated will receive more stable supplies through the facilities now under construction.

Through the water conservation and utilization program, the area of 155,000 acres to be benefited will probably be more than doubled as new projects now under investigation are added.

When the current program is completed, water will be available for about 10,958,000 acres, more than half of which will be represented by supplemental service for areas which were inadequately irrigated.

The demand for the construction of multiple-purpose projects under the Reclamation program continues unabated. The increase in population in the West, coupled with the industrial expansion incident to the national defense, is emphasizing the feasibility of combinations of power and irrigation facilities.

By investigations into practically every river basin in the West, the Bureau of Reclamation will have on hand a shelf of feasible projects which can be launched quickly to provide employment and new homes for a permanent population in the rural areas of the West and in the urban communities which they support.

Summary of irrigation and crop results on Federal Reclamation projects in 1940

State	Project and division or district	Projects constructed by Bureau				Projects furnished supplemental storage water				Projects furnished water under Warren Act			
		Irrigable area 1	Area in cultivation (paying area)	Crop values		Irrigable area 1	Area in cultivation (paying area)	Crop values		Irrigable area 1	Area in cultivation (paying area)	Crop values	
		<i>Acres</i>	<i>Acres</i>	Total	Per acre	<i>Acres</i>	<i>Acres</i>	Total	Per acre	<i>Acres</i>	<i>Acres</i>	Total	Per acre
Arizona Arizona-California	Salt River	243, 125	227, 125	\$16, 843, 965	\$74. 16								
	Yuma:												
	Valley Division	50, 245	44, 445	1, 971, 604	44. 36								
	Reservation Division	7, 743	2, 511	70, 698	28. 16								
	Bard Division	6, 232	4, 801	161, 043	33. 54								
California Colorado	Yuma Auxiliary (Mesa)	3, 810	1, 468	190, 788	129. 96								
	Total	68, 030	53, 225	2, 394, 133	44. 98								
	Orland	20, 574	15, 335	545, 249	35. 56								
	Grand Valley	30, 466	19, 771	435, 016	22. 00					8, 400	7, 700	570, 000	74. 03
	Orchard Mesa	10, 027	8, 027	549, 729	68. 48								
Idaho	Pine River 2					37, 680	26, 306	\$259, 243	\$9. 85				
	Uncompahgre	91, 633	60, 406	1, 157, 530	19. 16					3, 895	3, 278	67, 731	20. 66
	Boise:												
	New York Irrigation District	17, 763	15, 086	248, 843	16. 49								
	Nampa-Meridian Irrigation District	41, 101	35, 491	832, 932	23. 47								
	Boise-Kuna Irrigation District	48, 613	44, 077	941, 907	21. 37								
	Wildor Irrigation District	59, 322	51, 430	1, 513, 727	29. 43								
	Big Bend Irrigation District	1, 818	1, 621	25, 111	15. 49								
	Black Canyon Irrigation District, Unit 1	6, 894	6, 075	212, 421	34. 96								
	Black Canyon Irrigation District, Unit 2	27, 763	7, 222	88, 225	12. 22								
Minnesota	Total	203, 274	161, 002	3, 863, 166	23. 99					128, 032	113, 500	2, 598, 150	22. 89
	Minidoka:												
	Minidoka Irrigation District	71, 451	59, 038	2, 054, 863	34. 81								
	Burley Irrigation District	47, 937	44, 153	1, 602, 640	36. 30								
	American Falls Reservoir District No. 2	83, 722	69, 613	1, 468, 854	21. 10								
	Total	203, 110	172, 804	5, 126, 357	29. 67	93, 682	76, 852	1, 536, 904	20. 00	745, 632	657, 365	17, 887, 030	27. 21
	Upper Snake River Storage 2												

Summary of irrigation and crop results on Federal Reclamation projects in 1940—Continued

State	Project and division or district	Projects constructed by Bureau				Projects furnished supplemental storage water				Projects furnished water under Warren Act			
		Irrigable area ¹	Area in cultivation (paying area)	Crop values		Irrigable area ¹	Area in cultivation (paying area)	Crop values		Irrigable area ¹	Area in cultivation (paying area)	Crop values	
				Total	Per acre			Total	Per acre			Total	Per acre
Oregon	Umatilla:	<i>Acres</i>	<i>Acres</i>										
	East Division	10,911	7,569	\$115,316	\$15.24								
	West Division	7,620	4,269	77,878	18.24								
	Total	18,531	11,838	193,194	16.32								
	Vale	30,000	25,902	729,466	28.16								
Oregon-California	Klamath:												
	Main Division	41,081	31,243	1,482,456	47.45								
	Tule Lake Division	25,569	23,682	1,821,639	76.92					1,109	828	\$18,723	\$22.61
	Total	66,650	54,925	3,304,095	60.16								
Oregon-Idaho	Owyhee:												
	Advancement Irrigation District	692	624	13,100	20.99								
	Bach Irrigation District	2,310	2,187	74,923	34.26								
	Crystal Irrigation District	1,205	1,101	42,116	38.25								
	Owyhee Irrigation District	56,334	42,980	821,832	19.12								
	Payette-Oregon Slope Irrigation District	4,530	3,879	126,325	32.57								
	Ontario-Nyssa Irrigation District	5,893	5,400	168,024	31.12								
	Gem Irrigation District	28,886	23,720	620,783	26.17								
	Slide Irrigation District	1,095	878	19,415	22.11								
South Dakota	Total	100,945	80,769	1,886,518	23.36								
	Belle Fourche	72,746	38,649	950,699	24.60								
	Weber River (Salt Lake Basin)												
Utah	Hyrum					89,412	86,912	\$3,672,853	\$42.26				
	Moon Lake ²					8,329	5,945	194,909	32.79				
	Ogden River					65,591	52,204	390,222	7.47				
	Total					18,581	12,054	603,645	50.08				
										13,960	11,700	438,188	37.45

No dearth of feasible projects exists. Estimates are that there is sufficient water available in the West to irrigate an additional 22,000,000 acres, and provide supplemental supplies for 11,700,000 acres. Potential water power developments, in connection with irrigation developments, would doubtless provide as much as 30,000,000 kilowatts of electric capacity, more than three times the presently installed capacity.

Power

From the valleys of Texas rivers to the Pacific coast, from the Mexican to the Canadian borders, the Bureau of Reclamation moved to meet, so far as the area west of the Mississippi River is concerned, the critical deficiencies in electric power which are threatening the national defense program. Four new plants on Reclamation projects began operations in the fiscal year; installation of additional generating equipment was rushed in order to double existing capacity by 1943; and one new project was authorized as a part of the Bureau's effort to offset an imminent shortage of power in the Pacific Southwest.

In anticipation of pressure for power, the Bureau prepared for submission to the Congress a program of power installations on 50 potential multiple-purpose projects in the West, which could be constructed between 1943 and 1947. Including several steam plants to balance systems and additional generators for operating plants, 9,000,000 additional kilowatts could be made available in 6 years.

Investigations were advanced on scores of other projects with power potentialities.

At the close of the fiscal year 28 power plants were in operation on 17 projects with a total installed capacity of 953,962 kilowatts—an all-time high exceeding the capacity of all electric plants on the Pacific coast in 1912.

The high light of the power activities of the Bureau was on March 22 when two 10,000-kilowatt station service generators at Grand Coulee Dam on the Columbia Basin project in Washington began operating with the delivery of power to the Grand Coulee-Bonneville transmission system.

The first of three 108,000-kilowatt generators at Grand Coulee Dam was scheduled to go on the line in October; the second in December and the third in March. The allocation of aluminum and other plants for defense operations in this area will absorb more than the scheduled output. Three additional generators for Grand Coulee were on order to be available for production in the fall of 1943.

Indications were that still further installations at Grand Coulee in 1944 and 1945 will be necessary to meet the power demand in the Pacific Northwest. As the schedule stood at the close of the year,

Grand Coulee by the end of 1943 will be second only to Boulder Dam as the largest single producer of hydroelectric energy in the world.

At the Marshall Ford Dam on the Colorado River in Texas, the powerhouse was constructed by the Lower Colorado River Authority and power development, under the supervision of that agency, began January 25. The first of three 22,500-kilowatt units which went into operation on that date, was followed by a second in February.

Hydroelectric plants in operation on Reclamation projects, June 30, 1941

State	Project	Plant	Initial operation	Present kilowatt capacity	Ultimate capacity	Ultimate number of generators and capacities
Arizona	Salt River	Chandler	1919	600	600	1-600.
		Roosevelt	1906 ¹	15,400	15,400	1-5,500; 1-3,700; 2-1,300; 3-1,200.
		Arizona Falls	1913	850	850	2-425.
		Cross Cut	1914	5,100	5,100	1-3,000; 3-700.
		Stewart Mountain	1930	10,400	10,400	1-10,400.
		Horse Mesa	1927	30,000	30,000	3-10,000.
		S. Consolidated	1912	1,600	1,600	2-800.
		Mormon Flat	1926	7,000	7,000	1-7,000.
	Yuma	Siphon Drop	1926	1,600	1,600	2-800.
Ariz.-Nev	Boulder	Boulder	1936	704,800	1,322,300	15-82,500; 2-40,000; 2-2,400.
Ariz.-Calif	All-American	Drop 3	1941	5,400	10,800	2-5,400.
		Drop 4	1941	9,600	19,200	2-9,600.
Colorado	Grand Valley	Grand Valley	1932	3,000	3,000	2-1,500.
Idaho	Boise	Boise R	1912	1,875	1,875	3-625.
		Black Canyon	1925	8,000	8,000	2-4,000.
	Minidoka	Minidoka	1909	8,400	13,400	1-5,000; 1-2,400; 5-1,200.
Nebr.-Wyo	North Platte	Guernsey	1927	4,800	4,800	2-2,400.
		Lingle	1919	1,400	1,400	2-400; 2-300.
Nevada	Newlands	Lahontan	1911	1,500	1,500	3-500.
New Mexico	Rio Grande	Elephant Butte	1916 ²	24,300	24,300	3-8,100.
Texas	Colorado River	Marshall Ford	1941	45,000	67,500	3-22,500.
Utah	Strawberry Valley	Spanish Fork	1908	1,150	1,150	2-450; 1-250.
Washington	Columbia Basin	Grand Coulee	1941	20,000	1,974,000	18-108,000; 3-10,000.
	Yakima	Prosser	1932	2,400	2,400	1-2,400.
		Rocky Ford	1917	187	187	1-187.
Wyoming	Kendrick	Seminole	1939	32,400	32,400	3-10,800.
	Riverton	Pilot Butte	1925	1,600	1,600	2-800.
	Shoshone	Shoshone	1922	5,600	5,600	1-4,000; 2-800.
Total				953,962	3,567,962	

¹ Original plant; present plant 1909.

² Old plant. capacity 150 kilowatts; present plant completed 1940.

On the All-American Canal west of Pilot Knob, power is to be developed by the Imperial Irrigation District of Southern California. During the year two units of 5,400-kilowatt capacity each were installed at Drop 3 and two 9,600-kilowatt units at Drop No. 4.

Operation of the first of three 8,100-kilowatt units at Elephant Butte Dam on the Rio Grande project began in November 1940. The second and third generators went on the line in December and January.

To make power available more rapidly in areas where defense industries require great blocks of energy, installations were advanced

as far as the congested situations in the plants of equipment manufacturers would permit.

Boulder Dam power plant, with an installed capacity of 704,800 kilowatts, serves the country's largest airplane industries in southern California. Although Boulder's power supplies more than half the power in southern California, where reside nearly 3,500,000 persons, it has averted a serious deficiency in power in the central California region, which includes the industrial area of San Francisco Bay.

Two new generators which were being installed at Boulder Dam were to be on the line in October and December 1941, and a third on order was to go in operation in August 1942. Even with these installations, which will be many years ahead of the original schedule, further expansion of the generating facilities at Boulder Dam was being considered.

In addition to the vital airplane industry of the southern California areas, an aluminum plant and a giant magnesium plant being planned at Las Vegas, Nev., were increasing the demand for power in the Lower Colorado River area of the Pacific Southwest. The magnesium plant alone will require 196,000 kilowatts, a volume equivalent to the capacity of two and a half of the big generators at Boulder Dam.

The power plant at Parker Dam, downstream from Boulder, was nearing completion with the first of three generators scheduled to go on the line in December. A second machine was to begin operations in January and a third in February, making 90,000 kilowatts available principally to meet a market in central Arizona, where deficiencies have been met by the transfer of power from Boulder Dam. A fourth generator for Parker Dam was scheduled for service in 1943.

Davis Dam, at the Bullshead site, midway between Boulder and Parker Dams, for which an initial appropriation was made in the Interior Department Appropriation Act of 1942, was scheduled to begin producing power in 1944 with an installed capacity of 180,000 kilowatts. Plans were made for construction work on the dam to begin in the fiscal year 1942.

On the Central Valley project in California, four 75,000-kilowatt generators had been ordered for the Shasta Dam plant on the Sacramento River which will have a total installed capacity of 375,000 kilowatts by 1944. Plans were advanced for construction of Keswick Dam, 6 miles downstream from Shasta, which will have 75,000 kilowatts installed by late 1943.

In Idaho, which with Utah, is in the belt of areas where power deficits threaten not only defense activities but normal needs, the Bureau of Reclamation was prepared to begin construction of Anderson Ranch Dam, which will serve both irrigation and power demands.

Government forces were engaged on work at the Minidoka power

plant in Idaho, where a seventh unit of 5,000-kilowatt capacity was being installed.

Further eastward, work was being advanced to have power available at Green Mountain Dam on the Colorado-Big Thompson project, located on the western slope of the Continental Divide. Contracts for two 10,800-kilowatt generating units had been awarded. The 13.1-mile Continental Divide tunnel will carry water from the Colorado Basin to the eastern slope. Six power plants in the latter area will provide for double and triple use of the water without affecting the major purpose of the project—supplemental water for irrigation. Extending facilities of the Kendrick project in Wyoming, a 7,500 kilovolt-ampere substation at Laramie was completed in April.

By the end of July 1942, the total installations on Bureau of Reclamation projects will be increased to 1,615,462 kilowatts, a gain of 80 percent over the total at the end of June 30, 1941. By December 1943, installations will push past the 2,000,000-kilowatt mark. The present schedule will bring the total installations to 2,621,062 kilowatts in 1944; and to 2,836,062 kilowatts by the end of 1946.

Even with these planned installations, it is apparent that existing facilities, together with new facilities on order by non-Federal utilities, will be inadequate to supply the demand for power for a sustained defense program. The prospective requirement for 196,000 kilowatts of Boulder Dam power for a magnesium plant in Nevada is but one example.

In the preparation of the program of potential power installations the Bureau had in mind the challenge of deficiencies in power, existing and imminent in practically all areas west of the Mississippi River. In Washington and Oregon and in the Pacific Southwest, the low-cost power from projects constructed by the Bureau of Reclamation has proved a magnet for new industries.

On the basis of a 36 billion dollar annual defense expenditure, studies indicated that the West would be confronted by a deficit over and above all planned installations by the Bureau of Reclamation, of 2,000,000 kilowatts by 1945. This shortage would be increased to 2,455,000 kilowatts in 1946 and by 1947 would approach 3,000,000 kilowatts.

The significance of these deficiencies can perhaps be better understood when compared with the present capacity today of all power plants on the Pacific coast totaling 4,235,000 kilowatts. Under an all-out defense effort which would call for the utilization of the vast stores of minerals in western deserts and mountains, the additional power required might reach 4,000,000 kilowatts in 1947.

Included in the program of power developments to meet the anticipated deficiencies between 1943 and 1947 were installations at Boulder and Grand Coulee Dams which would bring them up to

their ultimate capacities of 1,322,300 and 1,974,000 kilowatts, respectively. The other projects were located in 16 States west of the Mississippi River, including Arkansas. The latter State was included since the Arkansas River rises in Colorado and developments on that stream are linked with plans for water conservation and utilization in the West.

The Bureau, in order to assure an adequate supply of energy for the West, is suggesting in several instances, a combination of steam with hydroelectric power to balance producing systems. Such a combination is desirable from several points of view because of the peculiar characteristics of many western streams, and in the interest of conservation and economic utilization of western resources in land, water, and fuel. Inclusion of a steam plant in connection with the plans for two power dams on the Central Valley project in California was recommended during the year, primarily for the purpose of stabilizing the output of the more valuable and more salable firm power of the system. In 40 years the net revenue from the steam plant would pay for its own costs with interest, and more than 25 percent of the entire cost of the Central Valley project, which otherwise would be repayable by water users or other beneficiaries.

Boulder Canyon Adjustment Act

The Boulder Canyon Adjustment Act of July 19, 1940, most important legislation during the year, provided for the adjustment of rates and charges for electrical energy generated at Boulder Dam which will result in a saving of approximately \$120,000,000 to power consumers in the Southwest. The act was effectuated in May 1941 when the Secretary of the Interior brought to successful conclusion conferences and negotiations extending over a period of 10 months by executing agency contracts with the city of Los Angeles and the Southern California Edison Co., making them agents of the United States in the operation of Boulder Dam, and new contracts with the power allottees who had contracted for power in 1930, including in addition to the two agents mentioned, the cities of Pasadena, Burbank, Glendale, the States of Arizona and Nevada, the Metropolitan Water District of Southern California, and the Nevada-California Electric Corporation.

The act authorized an adjustment in rates to reflect a reduction from 4 to 3 percent in the interest levied by the United States on its investment in the dam and power plant; the postponement until 1987 of repayment of an allocation of \$25,000,000 for flood control; repayment in full of all other costs during a period of 50 years from the time the project began producing firm energy on June 1, 1937; payment of \$300,000 a year to each of the States of Arizona and Nevada;

and payment of \$500,000 a year into a fund for further development of Colorado River basin projects.

The new contracts reduce the rates paid for energy from 1.63 mills per kilowatt-hour for firm and from .5 mills per kilowatt-hour for secondary energy to 1.163 mills per kilowatt-hour for firm and 0.34 mills per kilowatt-hour for secondary energy, provide for rates to be adjusted at 5-year intervals, but do not change the allotments nor the amounts the allottees are privileged or required to take. The agency contracts provide that the United States may interchange power from Parker Dam and Davis Dam for Boulder power allotted to the Metropolitan Water District, thereby assuring the Government of practically full correlation of Boulder and downstream projects.

Protection for Important Structures

Plans to prevent sabotage and protect irrigation and power facilities were developed during the year and \$460,000 was appropriated by the Congress to carry out a protective program. The program calls for a small force of civilian guards to be organized principally for patrol work at key structures on nearly 50 projects, including Grand Coulee Dam. The force of rangers stationed at Boulder Dam was increased during the year. Plans also call for the installation of floodlights, barricades, and other facilities on projects operated by the Bureau of Reclamation, the reimbursement of funds expended by local water users' associations in protecting structures operated by them, and the cooperation of State and local agencies in enforcing rules and regulations. Generally speaking there were few restrictions on visitors other than that they were barred from the work areas without special permits, but at most of the power plants they were permitted only in restricted areas and under observation of employees.

Water Conservation and Utilization Program

Five more water conservation and utilization projects were authorized for construction in the Great Plains and other drought areas of the West during the fiscal year, bringing to 11 the number approved under this program. They were: Eden project, Wyoming; Newton project, Utah; Mancos project, Colorado; Angostura project, South Dakota; and the Saco Divide project, Montana. Projects previously approved include: Buffalo Rapids, First and Second Divisions, Mont.; Mirage Flats, Nebr.; Buford-Trenton and Bismarck, N. Dak., and Rapid Valley, S. Dak.

This water conservation and utilization program, recommended by the Northern Great Plains Committee of the National Resources Planning Board, is designed to rehabilitate and stabilize the Great

Plains area and other western agricultural regions where critical droughts and water shortages during the 1930-40 decade have disrupted the economy of these areas and caused heavy relief expenditures. The program will avert continued dislodgment of large numbers of farm families from their present locations, reduce Federal relief costs occasioned by drought and migrations, quiet the disturbed economy of States to the westward and elsewhere which have been unable to absorb in productive activities the newcomers rendered destitute and cut loose by circumstances beyond their control, and provide employment.

More than 2,000 families are expected to be rehabilitated and made self-sustaining on these 11 projects and through land adjustments nearby. Employment is expected to be afforded for an average of 6,000 workers, mostly unskilled, for a period of 36 months. With more than 120,000 acres to receive a full or supplemental supply of irrigation water from these projects, direct support will be provided for an additional 400,000 acres, largely range land.

Construction of the irrigation facilities is the responsibility of the Bureau of Reclamation. Land preparation and settlement are the responsibility of the Department of Agriculture. Negotiations for the disposal of land in excess of economical-size units are also under the Department of Agriculture, which will also assume responsibility for the operation and for repayment contracts on most of the projects so far authorized. The Work Projects Administration and Civilian Conservation Corps provide most of the labor. The National Resources Planning Board coordinates the program.

The Congress included in the Interior Department Appropriation Act of 1940 an item of \$5,000,000 to assist in the financing of the necessary construction. Legislative authorization was embodied in the Case-Wheeler Act of August 11, 1939, amended by an act approved October 14, 1940. A subsequent appropriation of \$3,500,000 was made in the Interior Department Appropriation Act of 1941. This money was appropriated subject to allocation of nonreimbursable funds by the President, represented by contributions principally of labor and materials by the Work Projects Administration and the Civilian Conservation Corps. The combined reimbursable cost of the 11 projects already authorized amounted to \$8,751,000. The President had approved allotments of \$10,885,000 of nonreimbursable funds. Of the over-all construction costs of the 11 projects totaling \$19,636,000, a total of \$16,000,000 was allotted to the Bureau of Reclamation and the remainder to the Department of Agriculture.

The Eden project, approved for construction September 18, 1940, will provide supplemental water for the rehabilitation of 20,000 acres in southwestern Wyoming. The Newton project, approved

October 17, 1940, will benefit 2,225 acres in Cache County in north central Utah. A supplemental supply of water will be provided for 1,660 acres of irrigated land and a full supply for 565 acres of good arable dry land. The Mancos project, approved October 24, 1940, will provide a dependable supplementary supply of water for the irrigation of 10,000 acres in Mancos Valley, one of the oldest irrigation sections in western Colorado. The Angostura project, approved March 6, 1941, will supply water for 16,210 acres of drought-stricken dry-farmed land in Cheyenne River Valley in the western part of South Dakota. The Saco Divide project, approved April 11, 1941, will irrigate 9,400 acres between Beaver Creek and Milk River near Saco, Mont., by pumping from the Nelson South Canal of the Milk River project.

Work was already under way during the fiscal year on some projects under this program. Water was made available to irrigation farmers on the Buffalo Rapids project, First Division. Construction had advanced on the Second Division of that project and on the Buford-Trenton project. Some construction work had been done on the rapid Valley project and preliminary work in advance of construction was begun on the Mirage Flats, Eden, Newton, and Mancos projects.

There were under investigation or definitely scheduled for study about 50 proposed projects in 13 States which may later be considered for construction under this program.

Additional Projects Authorized

The following additional projects have been authorized under the Reclamation Project Act of 1939 for construction by the Bureau of Reclamation: Kings River project in California, a water storage project to provide supplemental irrigation water for 800,000 acres of developed land, flood control, and for power development, estimated to cost \$22,300,000; the San Luis Valley project on the Rio Grande in Colorado to serve 400,000 acres of developed land around Monte Vista in need of supplemental water for irrigation, estimated to cost \$17,-465,000; the Anderson Ranch project on the South Fork of the Boise River, in Idaho, for water conservation and irrigation, flood control, power and silt control, estimated to cost \$13,000,000, for which the President approved expenditure of not to exceed \$400,000 during the fiscal year to bring it up to the construction stage; the Paonia project in Colorado to supply supplemental water to lands in the valley of the North Fork of the Gunnison River, estimated to cost \$994,000, \$300,000 of which was made available for commencement of construction during 1940, but legal and engineering problems delayed the work.

When the Congress was considering the Kings River development and also a similar development on the Kern River in California, the President suggested that a good rule for the Congress to apply in considering these water projects would be that the dominant interest should determine which agency should build and which should operate the projects. Good administration continues to demand that projects in which irrigation and related conservation uses dominate should be constructed by the Bureau of Reclamation.

Columbia Basin Joint Investigations

Joint investigations to plan for the development of 1,200,000 acres of land to be irrigated by Grand Coulee Dam and the successful settlement of from 350,000 to 400,000 people on the Columbia Basin project in Washington were continued during the fiscal year and final reports submitted on several of the 28 problems which were set up for study in November 1939 when the investigations were launched by the Bureau of Reclamation. Completion of all the investigations is scheduled in ample time to prepare suitable programs before settlement starts. Participating in these studies in some capacity and in varying degrees are more than 40 agencies of the Federal, State, and local governments, educational institutions, private industry, and local civic organizations. Subjects of study range from how financial aid may best be extended to needy settlers to the location of sites for schools, churches, market centers and the like.

Land classifications, for the purpose of eliminating land not suited to irrigation farming, were completed by the Bureau for the entire project area during the fiscal year and land appraisals, to determine the value of the land without reference to future irrigation, were 90 percent completed. Determination was made of the first three blocks of land to be irrigated when water is made available, probably in 1944 or 1945. Settlers were being urged to request complete information about any Columbia Basin land in which they were interested from the Bureau of Reclamation, Coulee Dam, Washington.

Construction Program

Work was in progress on 37 projects in 14 Western States, continuing the major construction program undertaken by the Bureau of Reclamation in 1931, when work on the Boulder Dam and power plant, on the Colorado River in Arizona-Nevada, was started.

Ten storage dams and seven diversion dams were under construction during the year. Of these one storage and all seven diversion dams were completed. Enlargement of two dams—Willow Creek and

Pishkun on the Sun River project in Montana—was also completed.

The dams completed were the Crane Prairie, a 40-foot earth-fill structure on the Deschutes project in Oregon; Dutch Slough Dam on the Delta division of the Central Valley project in California; the Entiat and Icicle Creek Dams Nos. 1, 2, 3, 4, and 5, all small diversion dams constructed on the Columbia Basin project in Washington, in connection with migratory fish control operations.

The dams completed during the year bring to 163 the total number of dams completed by the Bureau since its origin in 1902. Twenty-three of these dams are now on irrigation projects operated by the Office of Indian Affairs. In addition the Bureau has made alterations to five dams on the projects constructed by other agencies, and two other structures are used jointly with other agencies. The Shoshone (1910), Arrowrock (1915), Owyhee (1932), and Boulder (1935), were the highest dams in the world when completed.

The nine dams under construction at the close of the year were: Grand Coulee Dam, a concrete, straight-gravity structure 550 feet high, on the Columbia Basin project in Washington, 96.7 percent complete; Shasta Dam, Central Valley project, California, a 560-foot straight-gravity concrete structure, 53.6 percent complete; Friant Dam, also on the Central Valley project and of the concrete, straight-gravity type, 320 feet in height, 72.6 percent complete; Green Mountain Dam on the Colorado-Big Thompson project in Colorado, a 274-foot earth-fill structure, 50 percent complete; Vallecito Dam, a 143-foot earth-fill structure on the Pine River project in Colorado, 87 percent complete; Wickiup Dam, also of the earth-fill type, 100 feet in height, on the Deschutes project in Oregon, 19 percent complete; Marshall Ford Dam on Colorado River project in Texas, a 270-foot concrete, straight-gravity structure with an earth embankment extending from the left abutment, 75 percent complete; Deer Creek Dam, Provo River project, Utah, an earth-fill embankment, 235 feet high, 85 percent complete; and the Box Butte Dam, a 64-foot earth-fill structure on the Mirage Flats project in Nebraska, on which Government forces started construction in May.

Several of these dams are outstanding in height and volume. Grand Coulee, nearing completion on the Columbia River in Washington is 4,300 feet long and requires the placing of 10,500,000 cubic yards of concrete, making it the largest concrete structure in the world. Shasta, 560 feet in maximum height above foundation, will be second in height to the 726-foot Boulder Dam, highest in the world. Water falling over its spillway in the center of the structure, will form a waterfall three times as high as Niagara. The dam will contain 6,000,000 cubic yards of concrete, being the second largest of its type. Marshall Ford in Texas will contain 1,877,000 cubic yards of concrete and 1,629,800 cubic yards of earth and rock. Green Mountain, with

4,450,000 cubic yards of earth and rock is the largest dam of its type yet undertaken by the Bureau.

During the fiscal year 1941 the Bureau constructed 247 miles of canals; 125 miles of drains; 6 tunnels with a total length of 53,128 feet; 351 miles of roads; 28 miles of railroads; 220 miles of transmission lines; 197 miles of telephone lines; 93 miles of pipe lines; 3,471 canal structures; 979 culverts; 50 flumes; and 160 bridges. There have been placed in dams and other structures 3,349,587 cubic yards of concrete, 4,069,780 cubic yards of earth, and 889,217 cubic yards of rock. The total number of barrels of cement used was 4,113,154. There were excavated during the year a total of 26,991,423 cubic yards.

Grand Coulee Dam Project

The Grand Coulee Dam, on the Columbia River near Almira, Wash., is the principal construction feature of the Columbia Basin project in west-central Washington. The purposes of the project are the irrigation of 1,200,000 acres of land in the Big Bend country, generation of hydroelectric power for irrigation pumping and industrial and urban consumption, river regulation and improvement of navigation. A reservoir 151 miles in length, extending to the Canadian border, is being formed by the dam, and will have a capacity of 9,800,000 acre-feet of which 5,400,000 acre-feet will be active storage. The estimated cost of the ultimate project is \$435,734,000. In addition to the dam, reservoir and irrigation system, construction features comprise a power plant to house ultimately eighteen 108,000-kilowatt and three 10,000-kilowatt generating units with a total installed capacity of 1,974,000 kilowatts, largest in the world; a balancing reservoir in the Grand Coulee, with a useful capacity of approximately 340,000 acre-feet and requiring 2 earth-fill dams; and a pumping plant for lifting water into the balancing reservoir, with 12 pumps, each driven by a 65,000-horsepower motor, with a combined capacity of 19,200 cubic feet per second.

Although the progress schedule under the existing \$36,645,000 contract calls for completion of the dam, left powerhouse and pumping plant foundation in March 1942, the concrete work is now practically completed with a total of 10,464,374 cubic yards, of which 415,000 cubic yards were placed during the fiscal year. Work remaining under the present contract comprises minor placements of concrete, and installation of eleven spillway drum gates, each 135 feet by 28 feet. At the end of the year the contract was 96.7 percent completed. During the year the contractors placed 15,509,000 pounds of reinforcing steel; installed 1,897,000 pounds of pipe and fittings; 17,456,997 pounds of drum gates and control mechanism; and 3,252,000 pounds of trashrack guides and sections.

Relocation of sections of the Great Northern Railroad and State and county highways in the reservoir area was carried on during the year. A contract for construction of earthwork, structures and track, Great Northern Railroad relocation, Kettle Falls to Williams and Kettle Falls to Boyds, started in August 1940, was 99.9 percent completed on June 30, 1941. Abutments and piers for the Great Northern bridge at Kettle Falls were completed in October 1940. Work on the superstructure for this bridge was begun in August 1940 and was completed in May. Superstructures for one highway and two railroad bridges over the Kettle River were also completed. River channel widening and shore protection near The Dalles were finished in April. Relocation of a road from Mink Creek to Stranger Creek in Ferry County was started in March.

Construction of facilities for migratory fish protection was in progress. At the Entiat station a contract for rearing ponds, diversion dam, dike, roads and drainage and water systems was 67 percent com-



HARNESSED FLOODS AID FERTILE FARM LANDS

Broad acres like these in the San Joaquin Valley in California benefit from the conservation program of the Bureau of Reclamation, under which roaring flood waters are captured behind gigantic dams, later to be released through spreading networks of irrigation ditches which form an integral part of such developments as the Central Valley project.

pleted. At the Leavenworth station the Wenatchee Canal and hatchery building were completed, also rearing ponds, drainage, sewerage and water systems, cold storage and heating plants and heating systems for the hatchery, garage and warehouse. The hatchery buildings at the Entiat and Winthrop stations were completed, and work was started on the construction of residences at the Leavenworth, Entiat and Winthrop stations, and on the rearing ponds and appurtenant works at Winthrop.

Central Valley Project

During the fiscal year rapid progress was made on construction features of the Central Valley project, the ultimate cost of which is estimated to be \$263,990,000. The Pacific Constructors, Inc., at the Shasta Dam began placing concrete on July 8, 1940, and on May 3, 1941, had placed the one millionth yard, with a maximum daily record of 7,346 cubic yards. At the end of the year this \$42,528,278 contract was 53.6 percent complete and 1,360,800 cubic yards of concrete of the 6,000,000 total had been placed in the structures. The Columbia Construction Co.'s \$6,231,612 contract for concrete aggregates, requiring the processing and delivering of 10,500,000 tons of sand and gravel was in force during the year. The 9-mile belt conveyor system from the Redding plant to the dam site was operated satisfactorily. Clearing of 1,040 acres in the Shasta reservoir site was completed and a contract was awarded for an additional 2,150 acres.

Work on the Friant Dam kept pace with Shasta and on June 30, 1941, a total of 1,167,622 cubic yards of concrete of an estimated 2,200,000 cubic yards required, had been placed, with a daily record of 7,634 cubic yards. Griffith Co. and Bent Co. had completed 72.6 percent of their \$11,075,541 contract at the close of the year. The first contract on the 37-mile Madera Canal, to extend from the Friant Reservoir to Ash Slough near Chowchilla was awarded and work started in October 1940 on an 8.4-mile section, involving earthwork, canal lining and structures, which was 29.4 percent complete.

On the 40-mile Contra Costa Canal, extending from the delta to near Martinez, a 9½-mile section was completed, also the canal headworks, Dutch Slough Dam and Nichols wasteway. Work was started in March on an additional 8.5-mile section, which was 14.0 percent complete. Relocation of the Southern Pacific Railroad around the Shasta reservoir site was nearly completed. Two contracts involving 9.22 miles of roadbed construction and comprising earthwork, tunnels and structures were completed, also the Sacramento River Second Crossing, Doney Creek, Salt Creek, and O'Brien Creek bridges. At the railroad and highway bridge over the Pit River, about 500 feet in height above the water surface, the abutments and piers were 99.9

percent and the superstructure 41 percent complete. A contract was awarded in March for installation of a centralized traffic control system, and telegraph and telephone facilities.

Four 75,000-kilowatt generators had been ordered for Shasta Dam, which will have an ultimate capacity of 375,000 kilowatts when five main units are in operation.

By means of Shasta Dam in the north and Friant Dam in the south, regulation of both the Sacramento and the San Joaquin Rivers will provide water to supplement the irrigation supply of a large area of highly improved orchard and farm lands in the southern San Joaquin Valley; reestablish navigation to Red Bluff on the Sacramento River; prevent salt water intrusion in the irrigation channels of the delta of the Sacramento-San Joaquin Rivers; provide supplemental water for irrigation, domestic and industrial uses on the Walnut Creek-Martinez area, south of Suisun Bay; and make possible the generation of hydroelectric power at Shasta Dam and Keswick Dam, a regulating dam on the Sacramento just below Shasta Dam.

Boulder Dam and the All-American Canal System

Erection of machinery and installation of electrical equipment in the Boulder power plant were in progress during the year, including two additional 82,500-kilowatt generating units, A-1 and A-2 in the Arizona wing. A third unit A-5 was on order. Approximately, 3,200,000,000 kilowatt-hours of electric energy were generated and the collections by the Government from the sale of electric energy were over \$6,000,000, with a monthly maximum of \$767,927 in August 1940. Lake Mead, with a capacity of 32,360,000 acre-feet, of which 3,321,000 is dead storage, in June contained a maximum of 30,220,000 acre-feet. Construction of an exhibit building was started by Government forces.

On the All-American Canal system a second 47-mile section of the 130-mile Coachella Canal was under construction. The contract was 85 percent complete at the end of the year. Placing a clay blanket on the bottom and side slopes of the All-American Canal a distance of about 15 miles was finished in July. All intercepting drains and drain structures east of the Yuma Canal on the Reservation Division of the Yuma project were completed in May. A contract for concrete or gunite lining, New Brier Canal, a distance of 2.5 miles, was awarded in April, and work was started in June. Work was started in May on construction of the Southern Pacific Railroad bridge on the Coachella Canal. Water was first delivered to the lands of the Imperial Valley through the All-American Canal on October 12, 1940, when water was diverted from the All-American Canal into the East Side Highline Canal of the Imperial Irrigation District.

Colorado-Big Thompson Project

Good progress was made on Green Mountain Dam and the Continental Divide tunnel, two important features of the Colorado-Big Thompson project, designed to provide a supplemental water supply for 615,000 acres of land now under cultivation, situated east of the Rocky Mountains in Colorado, with water collected and stored on the western slope of the mountains in the headwaters of the Colorado River. Stored water will be transported through the Continental Divide in a 13.1-mile tunnel to the headwaters of the Big Thompson River, a tributary of the South Platte River, where it will be re-stored for release as needed for irrigation.

Construction of Green Mountain Dam on the Blue River, which will form a reservoir storing 152,000 acre-feet of water, and power plant, to have an installed capacity of 21,600 kilowatts, was 49.8 percent completed at the end of the fiscal year.

An 8,000-foot section at the outlet end of the Continental Divide tunnel was completed in April and the contractor immediately started on an additional 7,000-foot section. At the inlet end of the tunnel, 6,600 feet were completed and a second contract was awarded for an 8,000-foot extension.

Transmission lines of 115-kilovolt capacity were constructed from Greeley to Fort Morgan, a distance of 54 miles, with a branch line to Wiggins, 6 miles long, and a 10½-mile extension from Fort Morgan to Brush. Substations were also completed at Fort Morgan, Wiggins, Brush, Greeley, and Poudre Valley.

Colorado River Project, Texas

The contract for construction of the Marshall Ford Dam to a height of 190 feet and involving the placing of 1,413,000 cubic yards of concrete was completed on October 10, 1940. A contract for completion of the concrete section of the dam to a height of 270 feet was awarded to the same contractors, Brown & Root and McKenzie Construction Co., and work was started on October 8, 1940. Of the 464,000 cubic yards of concrete remaining to be placed in the structure the contractors completed 385,215 cubic yards and the contract was 75 percent completed. An earth embankment 105 feet in maximum height, 2,500 feet long, and containing about 1,629,800 cubic yards of earth and rock extends from the south end of the river section of the dam. A contract for constructing this embankment was awarded to Cage Bros. and W. W. Vann & Co. Work was started on October 23, 1940, and the contract was 67 percent completed, approximately 817,700 cubic yards having been placed.

By enlarging the dam, a reservoir of 3,120,000 acre-feet capacity

will be provided, to be used jointly for flood control, power, and river regulation to augment the low-water flow for irrigation purposes along the Colorado River below Austin.

Boise Project

On the Payette division of the Boise project in Idaho, earthwork and structures were completed in August on sections of the A-Line Canal and D-Line Canal, and preparations made for a general opening of public land. A contract for earthwork and structures at the Graveyard Gulch and Langley Gulch wasteways was completed in April. Bids were invited on May 31 for construction of the Anderson Ranch Dam and power plant on the South Fork of Boise River near Mountain Home. The dam will be of the earth-fill type, 330 feet in height above stream bed and will contain 7,500,000 cubic yards of earth, 110,000 cubic yards of sand and gravel, 1,900,000 cubic yards of cobble and rock fill, and 90,000 cubic yards of riprap. It will be by far the largest structure of its type yet undertaken by the Bureau. The dam will create a reservoir of 500,000 acre-feet capacity to eliminate flood damages, provide irrigation water, and through its power plant of 20,000-kilowatt capacity make available 104,000,000 kilowatt-hours of energy annually.

Other Construction

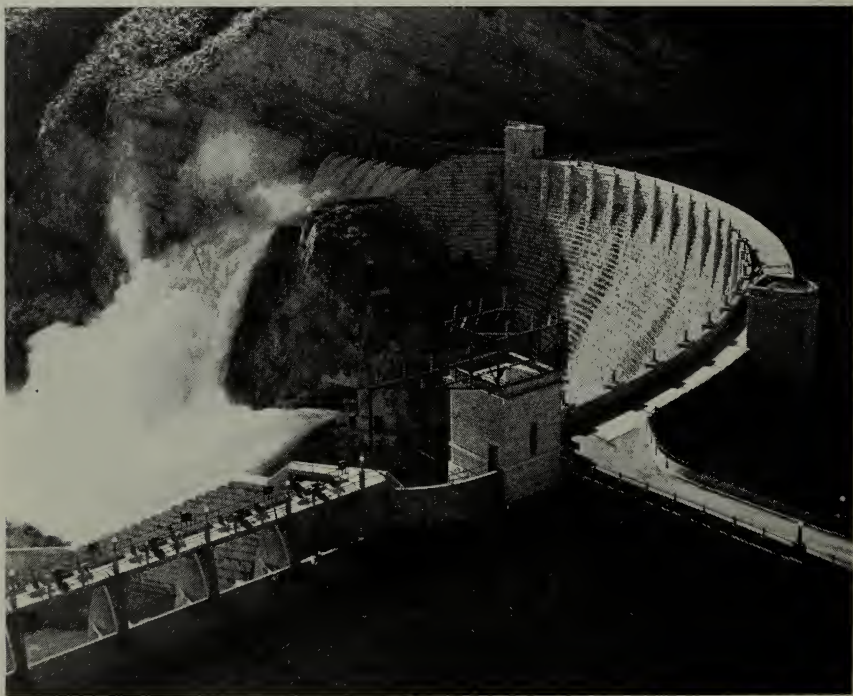
On the Provo River project in Utah, which is being constructed to conserve the waters of the Weber, Duchesne, and Provo Rivers for irrigation and domestic uses, the contract for construction of the Deer Creek Dam and railroad and highway relocation, started in July 1938, was 85 percent complete. Work was started in November 1940 on a 3-mile section of the 6-mile Duchesne Tunnel, which will divert water from the upper tributaries of the Duchesne River (Colorado River watershed) to the Provo River for storage in the Deer Creek Reservoir. The tunnel contract on the Salt Lake Aqueduct was 88 percent completed, the Olmsted Tunnel having been completed in November 1939 and the Alpine-Draper Tunnel holed through in December 1940. A 9-mile section of pipe line with structures was 83 percent completed. Government forces started work on enlargement of the Weber-Provo and Provo Reservoir canals.

Excavation at the Parker Dam on the Parker Dam power project in California-Arizona, for the powerhouse and appurtenant structures, was completed in October 1940. Government forces were engaged in the construction of the Parker power plant and the Phoenix substation. On the Gila project in southwestern Arizona the construction of pumping plant No. 1 on the Gravity Main Canal, near Blais-

dell, Ariz., was nearing completion. Work was started in May on one contract and in June on a second contract for construction of earthwork, concrete lining, and structures for "A" and "B" canals and laterals, which will irrigate 33,000 acres of rich desert land included in the Yuma Mesa area.

At the Tucumcari project in northeastern New Mexico good progress was made on earthwork, tunnels, and structures on the 25.4-mile section of the Conchas Canal, where work was started in April 1940. Work accomplished by Work Projects Administration forces comprised the construction of an administration building at Tucumcari, warehouse, garage and service building, and 4.9 miles of the Conchas Canal. Excavation was started on an additional 6.4-mile section. The irrigation outlet at the Conchas Reservoir was completed in April.

The Crane Prairie Dam on the Deschutes project in central Oregon was completed in August 1940 and the contract for construction of the outlet works at the Wickiup Dam in October. A contract for a



WATER BRINGS SECURITY TO THE WEST

Plunging cascades of water stored behind Roosevelt Dam on the Salt River project in Arizona afford a striking illustration of the facilities for food crops and defense power supplies provided by the conservation program of the Bureau of Reclamation in the semiarid West.

1.5-mile section of the North Unit Main Canal, including earthwork and structures, was awarded in February. Government forces were engaged during the year on the embankment at the Wickiup Dam and on sections of the main canal. On the Sun River project in Montana a contract was awarded in March for enlargement of the Willow Creek Dam, which will increase the capacity of the reservoir from 16,700 to 42,000 acre-feet. Lining of tunnel No. 1 on the Pishkun Canal with concrete was completed in November.

Work in progress on the Roza division of the Yakima project in Washington comprised construction of a 2-mile section of the Yakima Ridge Canal and Wasteway No. 2, which were completed in January; Wasteway No. 4; and portions of the lateral distribution system to serve an area of about 9,300 acres and also 550 acres under the Terrace Heights pump lateral. On the Heart Mountain division of the Shoshone project in Wyoming, the Shoshone Canyon conduit control works and tunnels were completed in April. A lateral distribution system to supply the first unit of 10,000 acres was completed and work was started on additional laterals and structures. The Vallecito Dam on the Pine River project in Colorado was practically completed at the end of the year.

Government forces were engaged in construction of the powerhouse at the Elephant Butte Dam on the Rio Grande project in New Mexico, and on the installation of machinery and equipment. A 115-kilovolt transmission line from Elephant Butte to Las Cruces, 62.5 miles in length, was completed in December. Work was started in March on the construction of substations at Deming and Central, and in April on 115-kilovolt transmission lines, from Elephant Butte to Deming and from Deming to Central, 72.5 and 45 miles long, respectively. On the Altus project in Oklahoma Government forces were engaged in quarry operations, relocation of State Highway No. 44 and building reservoir dikes. Excavation of the Casper Canal and laterals, building of structures and construction of drains were continued by Government forces on the Kendrick project in Wyoming. The Tule Lake tunnel on the Modoc unit, Tule Lake division, Klamath project, Oregon-California, was 75 percent completed.

Water Conservation and Utilization Projects

On the Buford-Trenton project in North Dakota excavation of about 12 miles of the main canal and laterals on Unit 1, which comprises about one-third of the project area, was completed by Government forces and Work Projects Administration labor. Lateral construction on unit 2 was started. Work was also in progress on canal and lateral structures and excavation at the pumping plant site. Two pumping units, 80 cubic feet per second capacity at 26 feet head,

were ordered in November. Government forces were engaged in the construction of canals, laterals and structures on the Buffalo Rapids project, Montana, on both the first division extension and the second division. Pumping units were ordered for the Fallon, Terry, and Shirley plants. Only preliminary work in advance of construction was under way on the Mirage Flats project in Nebraska and the Eden project in southwestern Wyoming.

Work in progress on the Rapid Valley project in South Dakota comprised preliminary surveys and investigations and testing of materials at Deerfield dam site prior to construction by Government forces, and building access roads to camp and dam sites. Other work included camp site topography and plans for Civilian Conservation Corps camp, and surveys for relocation of county roads. Only preliminary operations prior to construction were in progress on the Newton project in northern Utah and the Mancos project in southwestern Colorado.

Cumulative Construction Results

In the 39 years of its existence the Bureau has completed the following construction works on its irrigation projects: 85 storage and 78 diversion dams; 50 power plants; 364 pumping plants; 367 tunnels; 16,017 miles of canals and laterals; 5,931 miles of ditches and drains; 206,043 canal structures; 14,072 bridges; 22,504 culverts; 2,175 miles of pipe; 6,427 flumes; 3,735 miles of roads; 5,403 miles of transmission lines. The Bureau has excavated 580,845,369 cubic yards of earth and rock and placed 27,165,713 cubic yards of concrete in which 31,038,966 barrels of cement were used.

CCC Activities

Forty-four camps of the Civilian Conservation Corps continued in operation on various reclamation projects until May 1941, when the camp at Elephant Butte Reservoir, N. Mex., was transferred to the Army for civilian work on a military reservation in connection with the national defense program.

The training of enrollees in courses related to the national defense was emphasized with particular attention being given to the operation of heavy equipment. At the end of the year plans had been completed for the assignment of a number of CCC camps for construction of water conservation and utilization projects. A more complete account of the activities of the CCC camps on reclamation projects will be found in the section of the Secretary's report devoted to the Civilian Conservation Corps.

Operation and Maintenance

Upon completion of a reclamation project the major function of the Bureau of Reclamation becomes one of proper control of the irrigation system, to further the economic well-being of the settlers, and to insure reasonable protection of the investment of the United States. On 25 completed projects the operation and maintenance activities are supervised directly by organizations of water users, while on 16 operating projects the Bureau maintains a staff to perform these duties. Funds are advanced by water users on all projects for operation and maintenance by the Bureau. As a matter of general policy and in accordance with existing contracts the Bureau has retained the care and operation of reserved works, consisting of storage dams and other key structures, in practically all cases where the operation of the projects has been transferred to local organizations.

Several important programs for extending essential aid to operating projects were continued or were initiated during the year. Under authority of the act of June 17, 1940, financial assistance furnished by the Farm Security Administration to applicants qualified to obtain a reclamation farm unit under the regulations of the department, placed in effect during the fiscal year 1940, was continued through the fiscal year 1941. This assistance materially aided settlement of new lands on the Sun River project in Montana.

Educational work on projects for the purpose of making available to the farmers information on approved agricultural practices was continued throughout the year. This work was facilitated by use of motion pictures and received the support and cooperation of local groups, particularly the water users' organizations, county agricultural agents, and State colleges. The principal subjects which continued to receive special attention include the eradication of noxious weeds, the conservation of irrigation water, and prevention of soil erosion. The latter two were accomplished through an expanded program of lining canals to reduce the loss of water from seepage in transit to the farms, and by encouraging the economical use of water to the amount required for maximum crop production. The facilities of the CCC camps on the projects were responsible for the good progress made in weed control and canal lining.

Progress has been made in connection with the opening of public lands on the Payette division of the Boise project. Prior to a general opening of land in this area, a special public notice was sent to relinquishers of 2,755 irrigable acres of Carey Act lands in the division. As a result of this announcement seven persons had applied for reinstatement. At the end of the fiscal year plans had been completed and announcement made of the availability of 41 farm units, formal opening to take place on August 8, 1941. Studies were being made

in connection with the opening of public land on the Heart Mountain division of the Shoshone project, for which the canal system will soon be completed. Investigations were also under way of the areas which will come into production upon completion of the irrigation system for the Yuma Mesa area of the Gila project in Arizona and an additional area in the Tule Lake division of the Klamath project in California.

By a cooperative agreement with the Extension Service of the Department of Agriculture, dated June 12, 1940, arrangements were made for transfer of a limited amount of funds to that Service for the employment of several assistant county agents to work on certain reclamation projects in the States of Washington, Idaho, and Oregon, in cooperation with employees of the Bureau. These men had been giving their attention to the problems of the irrigation farmers, particularly the new settlers, aiding them in preparing lands for irrigation, and the application of water to crops. The assistance thus afforded the water users on a nonreimbursable basis proved to be so valuable that its continuation and limited expansion during the next fiscal year seemed justified.

Soil and Moisture Conservation

Under the President's Reorganization Plan No. 4, dated April 11, 1940, which directed that there be transferred from the Department of Agriculture to the Department of the Interior those activities related to soil conservation operations on lands under the jurisdiction of the Interior Department, the Bureau received an allotment of funds which made possible the launching of a soil and moisture conservation program. This program, while limited in extent, provides for conservation activities on a number of projects where erosion problems are known to exist but where funds have not been available to carry out the necessary work. For the purpose of supervising this work a Soil and Moisture Conservation Division was organized with headquarters in Denver, Colorado. For carrying out the purposes of this program, the reclamation projects were grouped into four large conservation districts, each with a district conservationist in charge. A number of surveys had been conducted and field operations initiated. The field work will be accomplished in cooperation with the personnel of the CCC camps.

Financial Aspects of Reclamation

Long-needed action was taken by the Congress this year to expedite construction of all projects financed from the Reclamation fund by providing that additional projects be financed from the general fund of the Treasury. The Interior Department Appropriation Act of 1942

authorized the transfer of the following projects to the general fund: Gila, Ariz.; Colorado-Big Thompson, Colo.; Anderson Ranch of the Boise project, Idaho; Tucumcari, N. Mex.; Altus, Okla.; and Roza Division of the Yakima project, Wash. Transfer of these projects made larger amounts available in the Reclamation fund for completion of the remaining projects financed from that fund.

This action was made necessary by the low level of accretions to the Reclamation fund which was seriously hampering the completion of needed Reclamation projects. The Reclamation fund, established by the Reclamation Act of 1902, is made up of the proceeds from the sale of public lands, from oil royalties and certain other increments in addition to repayments of construction costs. Under the Government's conservation policy, the income from the sale of public lands and from other sources has dwindled and the fund has become seriously depleted, as shown by the following tabulations:

Accretions to Reclamation fund by States

States	Sale of public lands		Proceeds from oil-leasing act		Total to June 30, 1941
	Fiscal year 1941	To June 30, 1941	Fiscal year 1941	To June 30, 1941	
Alabama.....			\$2, 886. 03	\$194, 259. 19	\$194, 259. 19
Arizona.....			1, 414. 24	3, 482. 22	2, 745, 519. 53
California.....	\$12, 736. 90	\$2, 742, 037. 31	1, 120, 185. 52	19, 516, 607. 03	27, 781, 938. 93
Colorado.....	31, 289. 23	8, 265, 331. 90	74, 675. 63	897, 368. 78	11, 210, 230. 04
Idaho.....	11, 167. 11	10, 312, 861. 26	680. 09	21, 726. 94	7, 065, 818. 63
Idaho.....	10, 346. 58	7, 044, 091. 69	2, 875. 38	3, 095. 26	1, 036, 614. 95
Kansas.....	57. 78	1, 033, 519. 69	31, 789. 94	308, 786. 36	308, 786. 36
Louisiana.....			27. 57	27. 57	27. 57
Michigan.....			14. 80	26. 25	26. 25
Mississippi.....			58, 959. 01	1, 421, 632. 73	16, 804, 737. 10
Montana.....	11, 784. 89	15, 383, 104. 37	78. 75	225. 75	2, 097, 057. 47
Nebraska.....	1, 809. 07	2, 096, 831. 72		5, 614. 22	1, 042, 762. 78
Nevada.....	3, 199. 02	1, 037, 148. 56		2, 769, 076. 49	9, 497, 593. 66
New Mexico.....	15, 646. 06	6, 728, 517. 17	583, 221. 64	210, 986. 12	12, 430, 563. 63
North Dakota.....	¹ 338. 77	12, 219, 577. 51	22, 045. 19		5, 933, 377. 81
Oklahoma.....	935. 02	5, 930, 677. 19	2, 677. 78	186. 82	11, 994, 710. 21
Oregon.....	¹ 1, 817. 22	11, 994, 523. 39		6, 935. 98	7, 739, 405. 04
South Dakota.....	¹ 1, 923. 84	7, 732, 469. 06	3, 625. 76	839, 118. 23	5, 209, 290. 66
Utah.....	3, 870. 36	4, 370, 172. 43	95, 543. 01	36, 681. 71	7, 502, 867. 25
Washington.....	3, 762. 14	7, 466, 185. 54	1, 406. 70		46, 712, 435. 27
Wyoming.....	12, 821. 62	8, 708, 284. 46	1, 011, 866. 69	38, 004, 150. 81	
Total.....	115, 345. 95	113, 065, 333. 25	3, 013, 973. 63	64, 242, 689. 08	177, 308, 022. 33
Proceeds, Federal water power licenses.....					² 855, 435. 62
Proceeds, potassium royalties and rentals.....					³ 847, 766. 25
Receipts from naval petroleum reserves, 1920 to 1938, act of May 9, 1938.....					29, 778, 300. 23
Grand total.....					208, 789, 524. 43

¹ Contra.

² Proceeds for fiscal year, \$26,980.55.

³ Proceeds for fiscal year, \$190,210.58.

Status of Reclamation fund

Accretions to the fund:

Sales of public lands.....	\$113, 065, 333. 25
Royalties and rentals under mineral leasing Act.....	64, 242, 689. 08
Potassium royalties and rentals.....	847, 766. 25
Federal water-power licenses.....	855, 435. 62
Receipts from naval petroleum reserves, 1920 to 1938, act of May 9, 1938.....	29, 778, 300. 23
Total accretions.....	208, 789, 524. 43

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Collection—construction and operation and maintenance repayments, water rentals, power, etc-----	\$134, 693, 708. 61
Total cash available-----	343, 483, 233. 04
Disbursements-----	331, 276, 829. 00
Balance in fund June 30, 1941-----	12, 206, 404. 04

Practically all projects now in operation have been constructed with appropriations from the Reclamation fund. Some large multiple-purpose projects, including Boulder Canyon (Boulder Dam, power plant, and All-American Canal), Columbia Basin (Grand Coulee Dam), Central Valley and Parker Dam power projects, which were initiated with emergency funds or under special acts are being financed with reimbursable funds advanced from the Treasury.

Appropriations and Funds

The operations of the Bureau of Reclamation during the fiscal year 1941 were financed with (1) direct appropriations from the Reclamation fund, (2) direct appropriations from the general fund of the Treasury, (3) appropriations from power revenues for the operation and maintenance of the Bureau's power plants, (4) funds advanced by water users' organizations for operation and maintenance, (5) funds contributed by interested parties for cooperative investigations of projects, and (6) the unexpended balances of Public Works Administration and Emergency Relief Appropriation allocations.

There follows a summarization of appropriations made for the Bureau of Reclamation for operations during the fiscal year 1941:

Interior Department Appropriation Act, 1941:	
Reclamation fund-----	\$9, 374, 600
Colorado River front work and levee system-----	15, 000
Boulder Canyon project-----	5, 500, 000
General fund, construction-----	43, 350, 000
Water conservation and utilization projects-----	3, 500, 000
First Deficiency Appropriation Act, 1941:	
Boulder Canyon project-----	1, 000, 000
General fund, construction-----	7, 500, 000
First Supplement Civil Functions Appropriation Act, 1941: General fund, construction-----	
	2, 900, 000
Fifth Supplemental National Defense Appropriation Act, 1941-----	
	55, 000
Grand total-----	73, 194, 600

Expenditures during the fiscal year 1941, from all funds available to the Bureau amounted to-----	82, 000, 084. 75
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Appropriations for Fiscal Year 1942

The following appropriations were carried in the Interior Department appropriation act for fiscal year 1942:

Reclamation fund.....	\$7, 371, 600
Colorado River front work and levee system.....	50, 000
Colorado River development fund.....	250, 000
Boulder Canyon project.....	7, 000, 000
General fund, construction.....	64, 505, 000
Water conservation and utilization projects.....	5, 000, 000
Valley Gravity Canal and Storage project, Texas.....	2, 500, 000
Protection of project works.....	50, 000
Second Deficiency Appropriation Act, 1941:	
Protection of project works.....	410, 000
Grand total.....	87, 136, 600

Repayments

The self-liquidating principle of the Reclamation Act, which provides for return of the construction costs by irrigation and power beneficiaries, has been maintained with respect to all projects regardless of the source of appropriations.

Construction payments during the year totaled \$2,018,743.99; operation and maintenance collections amounted to \$1,152,559.30; and water rental receipts were \$461,283.89.

Arrearages at the close of the fiscal year were: Construction, \$2,041,618.95; operation and maintenance, \$272,087.94; and water rental, \$154,804.12.

Operation of the Reclamation Project Act of 1939 in future years should largely correct situations resulting in such delinquencies.

Contracts Under the Reclamation Project Act of 1939

The Reclamation Project Act of 1939 (Public No. 260, 76th Cong.) contains, among other provisions, a provision for the amendment of existing repayment contracts to adjust annual payments to the ability of the water users to make these payments. Several methods of revising the payment schedules are possible under this act.

Approximately 30 requests from irrigation districts had been received for amendatory contracts. During the fiscal year detailed studies were made to determine the best possible revision that could be made to give maximum benefits to the water users. This has necessitated a thorough examination of the economic and financial condition of each district. At the end of the fiscal year a series of conferences was being held with water users' organizations of 12 districts which had requested revised contracts and it is anticipated

that early action can be taken on the preparation of final drafts and the execution of new contracts to provide more appropriate terms of repayment.

Revised contracts under the new act had already been executed with four water users' organizations and drafts had been prepared for 12 more districts which had requested relief under the act.

In a number of cases where new contracts were contemplated it was first necessary to make a reclassification of irrigable areas. Such reclassification work, authorized by section 8 of the 1939 act, was in progress continuously throughout the past year. On four projects or divisions of projects the surveys had been completed and final reports submitted; on three projects reclassification work was in progress; and on four projects such work was being planned for the near future.

Relief Extended to Water Users

Section 17 (b) of the Reclamation Project Act of 1939 provides for granting relief in the payment of construction charges due for any of the years 1939 to 1943, inclusive, when the water users are unable to pay, without great hardship, and make request for such postponement. Acting under this authority the Secretary had granted temporary relief by postponement of such payments due for 1940 in the case of 9 districts. The sum extended to June 30, 1941, amounted to \$531,051, which was 17 percent of the total amount due from all projects.

Over half of this sum was credited to the southwestern projects of the Salt River, Yuma, and Imperial Valleys, where unusual climatic conditions in the past two years had affected adversely the crop production and revenues. A severe water shortage occurred on the Salt River project during the 1940 season. The Imperial Valley and Yuma project suffered a severe earthquake on May 18, 1940, which damaged the canal systems and made it necessary to expend a large sum for repairs.

Surveys and Investigations

Twenty-nine basin surveys and 113 project investigations were in progress during the fiscal year by the Bureau of Reclamation. Forty-seven investigations of potential projects suitable for construction under the water conservation and utilization program were included. Allotments from regular appropriations as well as funds contributed for the purpose were being used.

The investigations are generally limited to (a) basin-wide surveys to determine existing developments and potentially feasible irrigation projects within a single stream basin and (b) project investigations

to determine the feasibility of individual projects from both the engineering and economic standpoints. While the primary purpose of the surveys and investigations is to determine the feasibility of irrigation developments, they include studies of the power, flood control and other incidental values of the potential developments being investigated. Engineers of the Bureau of Reclamation co-operate with other agencies of the Federal Government in their investigations of projects involving irrigation possibilities.

The status of the progress made during the year is given in the following paragraphs:

General Investigations

ARIZONA

Little Colorado River: Land classification, reservoir surveys and geological explorations completed; water-supply and economic studies in progress; detailed surveys of two water conservation and utilization projects in progress.

Hassayampa River: Land classification, reservoir and canal surveys completed; water-supply studies, both surface and underground, in progress.

Williams River: Land classification, reservoir and canal surveys completed; drilling of Alamo dam site by engineers of the War Department completed; water-supply and economic studies in progress.

Parker-Phoenix Aqueduct: Field surveys and water-supply studies in progress.

ARIZONA-NEVADA

Bullshead Reservoir: Report completed and submitted to the Congress.

ARIZONA-CALIFORNIA

Palo Verde and Cibola Valleys: Land classification work continued.

CALIFORNIA

Chuckawalla Valley: Land classification continued.

Sacramento Valley: Studies of water supply requirements for lands other than those to be supplied by the Shasta Reservoir are in progress; land classification in the American River service area completed; inventory of investigation possibilities in the American River valley completed; report on local irrigation from Sacramento River in progress.

San Joaquin Valley: Review of the War Department's flood control reports and correlating surveys of several areas in progress.

Clikapudi: Land classification studies completed; water supply studies in progress.

COLORADO

Western slope surveys: Field surveys completed and water supply and economic studies continued for the Roan Creek, Troublesome and Piceance areas.

Dolores-Montezuma, Dove Creek: Land classification completed; gaging stations established on tributary streams and water supply studies in progress.

Upper Gunnison: Land classification completed; gaging stations on tributaries established; water supply studies continuing.

Grand Mesa: Land classification completed; surveys of several sites completed and others in progress; water supply studies continuing.

Yampa River below Yampa, Colo.: Land classification completed; gaging stations established; water supply and economic studies continued.

Blue River-Platte River, Transmountain Diversions: Tentative report completed; additional surveys and studies in progress.

Eastern slope surveys.

Trinidad (Purgatoire): Tentative draft of report completed. The report on the Arikaree and South Republican areas were discussed in a tentative report on the Republican River basin. The data previously collected for the Smoky Hill area will be included in a report on the Smoky Hill River.

COLORADO-KANSAS

Arkansas Valley: Field surveys and water-supply and economic studies continued.

COLORADO-NEW MEXICO

Ship Rock: Field surveys continued.

COLORADO-WYOMING

Little Snake: Reconnaissance made of potential reservoir sites; gaging stations on tributaries established; water-supply and economic studies in progress.

IDAHO

Southwestern Idaho Investigations:

Weiser River: Surveys and geological explorations completed for several reservoir sites; water-supply and economic studies in progress.

Mountain Home: Land classification continued. Study of Scriver Creek power plant started.

Salmon River: Land classification and field surveys in progress.

South Fork of the Snake River: Tentative report completed.

IDAHO-MONTANA

Madison River-Snake River Diversion: Possibility of diverting water from the Madison River to the Snake River has been given consideration in the past. Further work on this study is being carried on in connection with the investigation of the Missouri Valley above Great Falls, Montana.

KANSAS

Western Kansas Reconnaissance: Reconnaissance surveys covering reservoir sites; and land classification and canal alignment along the tributaries of the Arkansas, Smoky Hill, and Republican Rivers completed. Reconnaissance report for Republican River submitted. Report on Smoky Hill River in preparation.

MONTANA

Missouri Valley above Great Falls: A comprehensive basin-wide study of potential irrigation and power developments in progress. Work is being done in cooperation with the Montana Power Co. and the Montana State Water Conservation Board. The investigation will include completion of studies for the Madison, Gallatin, and Dearborn Valleys, the Canyon Ferry dam site, and the Daley Spur project.

Marias: Tentative report submitted.

Rock Creek (Valley County): All field work and water-supply and economic studies completed. Report being prepared.

Fort Peck Pumping: Land classification and canal surveys completed, water-supply studies, transmission-line surveys, and economic studies completed.

Missouri River Basin below Great Falls: General reconnaissance has been made of area in Chouteau County, on Teton River tributaries, and along the Sun River. Water-supply studies have been in progress for the Judith River and Flat Willow areas.

Yellowstone River: Investigations to determine storage possibilities are in progress. Land classification nearing completion.

Hardin Project: Land classification has been completed; canal surveys and water-supply studies in progress.

Bitter Root Valley: Land classification, geological surveys and water-supply studies in progress.

NEBRASKA-COLORADO-KANSAS

Republican River surveys: Field reconnaissance completed; report submitted.

NEBRASKA-KANSAS

Bostwick project: Land classification, dam site and canal surveys in progress.

NEVADA

Humboldt River: Water-supply studies continued.

NEW MEXICO

Middle Rio Grande: Inventory of present developed works together with economic and water-supply studies in progress.

Pecos River Joint Investigations: National Resources Planning Board has completed its report.

NORTH DAKOTA

Missouri River Tributaries: Field surveys and water-supply and economic studies continued. Preliminary report on Cannonball River completed.

NORTH DAKOTA-SOUTH DAKOTA

Missouri River pumping projects: Field surveys, water-supply and economic studies of several potential pumping developments along the Missouri River have been completed. Report in preparation

OKLAHOMA

North Canadian River Investigation (includes Fort Supply, Optimo, and Canton areas): Field work completed, economic and water-supply studies continued. Tentative progress report on the Fort Supply area has been submitted.

Mangum Project: Field surveys and land classification in progress.

Wachita Reconnaissance: Field work completed and water-supply studies in progress.

OKLAHOMA-NEW MEXICO-TEXAS

South Canadian Reconnaissance: A preliminary field survey has been made of the area and water-supply studies are in progress.

OREGON

Grande Ronde project: Field work and water supply and economic studies completed. Tentative report completed.

Medford project: Field work completed, tentative report submitted.

Jackson and Josephine Counties cooperative investigation: Field surveys in progress.

Willamette Basin: Surveys of East Long Tom, Yamhill and Tualatin areas in progress.

SOUTH DAKOTA

Buffalo Gap project (Beaver Creek): Field work and water supply and economic studies continued.

TEXAS

Balmorhea project: Detailed surveys and water supply and economic studies completed. Tentative report completed.

Robert Lee project: Detailed surveys and water supply and economic studies continued. Report being prepared.

Palo Duro reconnaissance: Surveys and studies in progress.

Brazos River reconnaissance: Field work in progress.

UTAH

Colorado River surveys:

Price-Gooseberry, Blue Bench, Ouray, Virgin River, Kanab Creek, Uinta Basin, and Vernal-Ashley projects: Field surveys, water supply and economic studies in progress.

Colorado-Great Basin project: Land classification, geological surveys, water supply and economic studies in progress.

Salt Lake Basin cooperative surveys: Weber River, Woodruff, Big Creek, Otter Creek, Beaver Creek, Bally Watts projects: Field surveys and water supply and economic studies in progress.

Utah power investigations: Power market studies and surveys of potential power reservoirs on the Colorado River in progress. Tentative report submitted.

WASHINGTON

Columbia Basin project: Land classification and appraisal surveys completed.

Yakima River Basin: Cooperative investigation with Army engineers relative to flood control in progress.

WYOMING

Colorado Basin surveys: Green River projects, including Daniels, Pinedale, and Seedskanie: Field work and water-supply and economic studies continued.

Big Horn Basin: Reconnaissances have been made of the Grey Bull, Shell Creek, Wood River, Gooseberry Creek, Nowood River, and Fifteen Mile Creek areas. Soil surveys have been made of the Buffalo Basin, Schuster Flats, Grass Creek, and Cottonwood Creek areas. Water-supply studies and land classification surveys are in progress.

WYOMING-MONTANA

Powder and Tongue Rivers: Reconnaissance surveys, land classification and water-supply studies in progress.

WYOMING-UTAH-IDAHO

Green River-Bear River Diversion: Reservoir and canal surveys and water supply and economic studies continued.

Water Conservation and Utilization Projects

ARIZONA

Winslow (Chevalon) and Snowflake (Silver Creek) projects: Reservoir and canal surveys completed; land classification surveys and water-supply studies in progress; Bureau of Agricultural Economics studying project economics.

COLORADO

Collbran: Field work nearing completion; water-supply studies in progress.

Huerfana: Field work practically complete; water-supply studies in progress. Completion of report awaits agreement between the States of Kansas and Colorado regarding the use of the flow of the Arkansas River.

La Platta: Tentative report submitted.

Mancos: Tentative report and preconstruction surveys completed.

Pine River extension: Preliminary draft of tentative report prepared in the field.

Silt: A tentative report completed. Preconstruction studies and surveys in progress.

West Divide: Report completed in 1937; additional water-supply studies in progress.

COLORADO-NEBRASKA

North Republican: Tentative report completed; preconstruction studies in progress.

IDAHO

Cambridge Bench: Dam site surveys completed; geological explorations in progress.

Counsel, Hornet Creek, Medicine Lodge, and Mesa Orchards projects: Stream gaging in progress.

Lewiston Orchards: Field survey and water-supply studies in progress.

Malad Valley: Dam site surveys completed; land classification and water-supply studies in progress.

Mann Creek: Tentative report completed and preconstruction surveys in progress.

Rathdrum Prairie: Report completed in April 1939; additional studies in progress.

MONTANA

Missoula Valley: Tentative report completed; preconstruction studies in progress.

Sweetgrass: Water-supply studies in progress.

NEBRASKA

Cambridge: Reservoir and dam-site surveys completed; engineers of War Department studying flood-control value; tentative report in preparation.

NEVADA

Fort Mohave: Field work completed and report in preparation.

NORTH DAKOTA

Heart River: Practically all field work completed and tentative report in preparation.

Knife River: Reservoir and dam-site surveys completed.

OKLAHOMA

Kenton: Preliminary report completed in July 1938; reservoir site being drilled by engineers of War Department; additional water supply and economic studies in preparation.

Fort Supply: Tentative report completed; supplemental data being obtained.

OREGON

Bully Creek (Vale): Tentative report in preparation.

Beaver Creek and Clear Creek projects: Stream gaging in progress.

Canby: Tentative report completed. Preconstruction studies in progress.

Crooked River: Report completed in May 1936; supplemental surveys and studies in progress.

SOUTH DAKOTA

Angostura and Rapid Valley projects: Tentative reports completed. Supplemental surveys and studies in progress.

TEXAS

Balmorea: Tentative report submitted.

UTAH

Emery County (San Rafael) and Gooseberry-Price River projects: Tentative report submitted; supplemental field work in progress.

Newton: Tentative report submitted; preconstruction studies in progress.

Ash Creek, East Canyon, Pine Valley, and Moody: Stream gaging in progress.

Hickerson Park: Preliminary work completed; water-supply studies in progress.

WYOMING

Johnson County: Land classification and dam site surveys in progress.

Lyman: Tentative report submitted; preconstruction studies in progress.

Owl Creek: Land-classification and dam-site surveys completed; water-supply studies in progress.

Paint Rock: Dam site and reservoir surveys in progress.

Organization

The Commissioner, appointed by the President and under the supervision of the Secretary, is in administrative charge of the Bureau of Reclamation. He is supported by a staff of 138 officers and employees in Washington. The Chief Engineer at Denver, Colo., assisted

by 1,024 employees, is in general supervision of the engineering and construction activities. Twenty-six construction engineers in charge of projects now under construction, five engineers, a director of power at Boulder City, Nev., and three supervising engineers, located at Coulee Dam, Wash.; Sacramento, Calif.; and Estes Park, Colo., report to the chief engineer. Sixteen superintendents in charge of completed projects report to the supervisor of operation and maintenance at Washington. The 57 field offices, including the Denver office and 5 legal offices, have a combined personnel of 7,636.

In addition, there were 13 CCC employees in Washington office, 11 in Denver, and 418 in the field, making a total of 442 CCC employees. At the close of June 30, 1941, 43 CCC camps were operating on reclamation projects.

John S. Moore was appointed field supervisor of Soil and Moisture Conservation Operations, a new division of the Bureau of Reclamation, in December 1940. With headquarters in Denver, the field supervisor, assisted by three regional conservation supervisors, reports directly to the Commissioner.

Consolidated financial statement, June 30, 1941

DEBIT SIDE

Construction account, primary projects:

Cost of irrigation works:		
Original construction	\$517,840,169.71	
Supplemental construction	13,335,640.20	
Value of works taken over	2,557,277.57	
	<hr/>	
Total construction cost	533,733,087.48	
Operation and maintenance cost prior to public notice, net	\$3,217,047.63	
Operation and maintenance deficits and arrearages funded with construction	6,054,565.14	
Penalties on water-right charges funded with construc- tion	3,251,550.17	
	<hr/>	
	12,523,162.94	
	<hr/>	
Total	546,256,250.42	
Less income items:		
Construction revenues	\$8,893,058.99	
Contributed funds	2,240,088.66	
Nonreimbursable appropriations, other Federal agencies	3,882,986.60	
	<hr/>	
	15,016,134.25	
	<hr/>	
	531,240,116.17	
Less abandoned works, nonreimbursable costs and charge-offs	17,132,250.70	
	<hr/>	
Balance payable		\$514,107,865.47
Palo Verde flood protection, cost of construction and repairs		48,806.46
Secondary projects and general investigations:		
Cost of surveys and investigations	\$6,584,793.40	
Less contributed funds	731,139.24	
	<hr/>	
		5,853,654.16
General offices expense undistributed		353,958.23
Plant and equipment		2,020,574.67
Materials and supplies		7,927,322.07

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Accounts receivable:	
Current accounts	\$2, 755, 333. 54
Deferred accounts	248, 327, 778. 26
	<hr/> \$251, 083, 111. 80
Undistributed clearing cost accounts	3, 602, 247. 47
Unadjusted debits, disbursement vouchers in transit	4, 475. 98
Cash:	
Balance on hand:	
Reclamation fund	\$12, 206, 404. 04
General fund	74, 672, 381. 22
National Industrial Recovery and P. W. A. allotments	539, 929. 12
Emergency relief allotments	184, 457. 04
Contributed funds	139, 600. 90
	<hr/> 87, 742, 772. 32
In special deposit account	33, 195. 93
	<hr/> 87, 775, 968. 25
Total debits	<hr/> 876, 777, 984. 56

CREDIT SIDE

Security for repayment of cost of irrigation works: Contracted construction repayments...	\$305, 040, 499. 24
Current accounts payable	12, 760, 313. 49
Deferred and contingent obligations	1, 245, 216. 64
Reserves and undistributed profits	11, 607, 729. 27
Operation and maintenance results, surplus	881, 386. 07
Unadjusted credits, collection vouchers in transit	1, 658. 17
Government aid for reclamation of arid lands:	
Reclamation fund	\$208, 789, 524. 43
Advances to Reclamation fund:	
Treasury loan (act of June 25, 1910)	\$20, 000, 000. 00
Less amount repaid	20, 000, 000. 00
	<hr/>
Treasury loan (act of Mar. 4, 1931)	5, 000, 000. 00
Less amount repaid	5, 000, 000. 00
	<hr/>
National Industrial Recovery and Public Works Administration allotments	75, 018, 961. 86
Emergency relief allotments	46, 767, 012. 28
Work Projects Administration direct expenditures	585, 074. 45
General fund:	
Central Valley project	101, 750, 000. 00
Grand Coulee Dam project	107, 250, 000. 00
Other appropriations	27, 983, 799. 40
	<hr/>
	568, 144, 372. 42
Less nonreimbursable appropriations, other Federal agencies	3, 882, 986. 60
	<hr/>
	564, 261, 385. 82
Less impairment of funds:	
Abandoned works	\$2, 828, 234. 62
Nonreimbursable construction cost	382, 097. 31
Operation and maintenance cost uncollectible	986, 889. 66
Washington office cost since December 5, 1924	3, 220, 062. 22
Attendance at meetings	1, 815. 90
Giving information to settlers	11, 238. 17
Prepaid civil-service retirement fund	2, 340. 33
Charge-offs (act of May 25, 1926)	14, 699, 308. 24
Operation and maintenance administration	89, 553. 14
Administrative costs, Denver and field legal offices	536, 912. 94
Returned to Treasury, miscellaneous receipts	199. 56
Impounded funds, economy acts	261, 552. 05
	<hr/>
	23, 020, 204. 14
	<hr/>
	541, 241, 181. 68
Total credits	<hr/> 872, 777, 984. 56

Consolidated statement by projects of construction cost of irrigation works, other items reimbursable with construction and amounts repayable

State and project	Construction cost		Operation and maintenance (net)		Operation and maintenance rearages and penalties		Construction contributed funds, and nonreimbursable appropriation (contra)		Abandoned works, nonreimbursable cost, and authorized charge-offs	Total repayable	
	Fiscal year 1941	To June 30, 1941	Fiscal year 1941	To June 30, 1941	Fiscal year 1941	To June 30, 1941	Fiscal year 1941	To June 30, 1941		Fiscal year 1941	To June 30, 1941
Arizona:											
Gila		\$5,143,881.15									
Salt River	\$852,428.40	20,227,628.13							\$852,428.40		\$5,143,881.15
Yuma Auxiliary	2,625.01	902,060.50							1,880,361.59		17,789,460.93
Arizona-California: Yuma		9,373,406.10							1,134.82		900,962.18
California:									1,17,191.61		9,691,101.87
Central Valley	29,099,735.95	70,726,381.70							29,034,571.02		70,557,267.55
Orland		2,448,669.71							861.82		2,470,580.71
Colorado:											
Colorado-Big Thompson	2,688,404.67	7,383,673.06							2,655,114.57		7,331,812.78
Fruitgrowers Reservoir	1,864.88	199,058.55							1,864.88		196,558.55
Grand Valley	49.45	5,020,690.80							49.45		4,081,774.01
Paonia	17,995.58	34,937.56							17,995.58		34,937.56
Pine River	731,650.71	3,200,375.04							731,170.71		3,198,895.04
San Luis Valley	51,292.63	51,292.63							51,292.63		51,292.63
Uncompagre	117,322.76	8,880,349.90							117,322.76		8,102,101.03
Idaho:											
Boise	100,617.18	16,931,283.63							100,617.18		17,158,898.74
Boise-Payette	372,547.09	3,891,451.93							379,809.68		3,897,234.80
King Hill		1,905,918.80									
Minidoka	441,747.43	19,745,470.89							440,773.35		18,659,748.78
Upper Snake River	23,344.08	2,773,712.70							22,867.30		2,777,980.42
Kansas: Garden City		342,963.68									
Montana:											
Bitter Root		947,641.05									1,464,279.00
Chain Lakes	13,407.83	1,732,097.66							13,407.83		1,688,297.66
Frenchtown	1,962.98	272,484.35							1,962.98		277,980.61
Huntley		1,559,590.46									1,862,804.92
Milk River	149.08	6,928,160.44							1,461.16		5,653,177.88
Sun River	154,266.34	9,344,747.35							153,286.12		9,442,489.46
Montana-North Dakota:											
Lower Yellowstone		3,685,433.14							1,1,550.63		4,109,023.87
Nebraska-Wyoming:											
North Platte	7,464.66	19,546,138.60							8,802.63		20,972,165.34

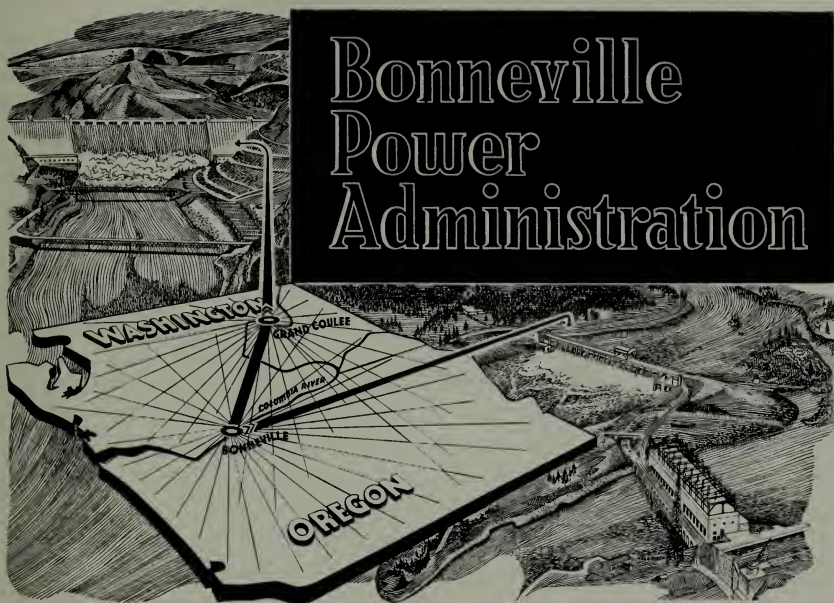
See footnotes at end of table.

Washington:	18, 467, 106.85	136, 925, 344.51	147, 766.87	26, 882.64	46, 933.63	290, 996.19	18, 420, 173.22	136, 634, 348.32
Grand Coulee.....	92, 202.06	1, 452, 129.45	1 64, 357.08	150, 213.70	27, 839.41	7, 496.28	997, 861.70	425, 887.24
Okanoogan.....	751, 659.53	26, 346, 976.81	12, 831.48	1 2.80	39.10	590, 704.24	4, 214.60	25, 837, 914.59
Yakima.....	751, 659.53	8, 316, 021.32	12, 831.48	1 2.80	39.10	39.10	764, 451.91	8, 328, 813.70
Wyoming:								
Kendrick.....	717, 460.82	17, 687, 348.60	26, 305.28	112, 821.11	2, 613.93	13, 959.20	724, 851.59	17, 699, 694.68
Riverton.....	116, 170.15	6, 096, 035.49	36, 714.83	119, 802.51	1, 207.01	26, 330.66	102, 142.03	6, 189, 507.34
Shoshone.....	5, 122.73	10, 111, 334.59	83.51	467, 235.88	51, 594.29	814, 162.27	1, 545, 129.47	8, 255, 993.56
Shoshone-Heart Moun- tain.....	466, 211.10	4, 011, 673.29					496, 211.10	4, 011, 673.29
Total.....	62, 113, 541.46	533, 733, 087.48	3, 217, 047.63	48, 517.82	9, 306, 115.31	14, 815, 430.52	17, 132, 250.70	514, 308, 569.20

WATER CONSERVATION AND UTILIZATION PROJECTS

Colorado: Mancos	\$8, 748.39	\$8, 748.39					\$8, 748.39	\$8, 748.39
Montezuma								
Buffalo Rapids, first division ¹	251, 868.83	1, 761, 695.56	\$17, 338.94	\$17, 922.27	\$258.00	\$473.00	268, 949.77	1, 779, 144.83
Buffalo Rapids, second division.....	254, 966.84	281, 248.22					254, 966.84	281, 248.22
Nebraska: Mirage Flats	299, 652.12	304, 530.10					299, 652.12	304, 530.10
North Dakota: Buford- Frenon.....	285, 531.80	371, 837.67					285, 531.80	371, 837.67
South Dakota:								
Angostura.....	9, 804.25	9, 804.25					9, 804.25	9, 804.25
Rapid Valley.....	48, 039.91	69, 920.06					48, 039.91	69, 920.06
Utah: Newton.....	17, 935.80	17, 935.80					17, 935.80	17, 935.80
Wyoming: Eden.....	13, 378.21	13, 378.21					13, 378.21	13, 378.21
Total.....	1, 189, 926.15	2, 839, 093.26	17, 338.94	17, 922.27	258.00	473.00	1, 207, 007.09	2, 856, 547.53

¹ Contra.² Caballo Dam combined with Rio Grande Power in this report.³ Major portion of expenditures made from emergency relief funds.



PAUL J. RAVER, Administrator

Conservation and Defense

THE WEIGHT of the Bonneville Power Administration's resources was brought into play during the fiscal year 1941 in behalf of the national-defense effort without impairment of the Government's long-time program for development of the Pacific Northwest in accordance with sound conservation practice.

During the 12-month period the Administration's power sales made possible the production of nearly 60,000,000 pounds of aluminum pig metal—thus greatly enhancing the over-all volume of this vital defense metal.

The year also brought establishment of new power-using aluminum plants which, as they approached capacity operation at the close of the period, were producing metal at a rate sufficient to build one-fourth of all planes scheduled for production in the Nation during the ensuing 12 months.

In addition to this accomplishment, the power administration contributed to the establishment of a number of new electrometallurgical and electrochemical plants scheduled to facilitate the defense effort by the production of calcium carbide, chlorate compounds and ferro alloys vitally essential to the manufacture of explosives and other strategic materials.

Although of tremendous immediate importance to defense, development of all of these plants was even more significant from the standpoint of sound conservation. Since its inception, the Bonneville project, in its broadest aspects, had been devoted to the principle of balancing the Pacific Northwest's ailing timber and farm economy by the application of low-cost power in the large electro industries which, during the last 20 years, have become the key to modern technical enterprise.

The plan already was well under way early in the fiscal year 1941 when the first units of the Aluminum Co. of America's Vancouver, Wash., reduction plant went into production. The skeletal essentials of a high-voltage transmission implement already were in service. The impact of the defense emergency in the autumn of 1940 meant, simply, accomplishing in from 3 to 5 years what had been planned for a decade's normal development.

Accordingly, from September 1940 to June 30, 1941, the Bonneville Power Administration found it necessary to enlarge its activities, not in scope but merely in degree.

Net results at the close of the fiscal year showed 321,880 kilowatts of power sold under contract; annual rate of power income increased from \$367,970 to \$1,874,332; generating capacity increased from 86,400 kilowatts to 208,400 kilowatts; the transmission system increased from 142.3 to 1,176.8 miles; and the development of six new industrial customers, all of which involved production for defense and all of which were the first of their types to be established west of the Mississippi River.

With all this, the soundness of the principle of public ownership proved itself anew, not only from the long viewpoint but as an immediate contribution to the defense effort. From a practical standpoint, defense industries looking for new power sources found public ownership had made migration of their enterprises to the Pacific Northwest entirely feasible in spite of the region's distance from the nation's heavy production and market centers. Fundamentally, this feasibility was built upon the fact that Columbia River power was nonprofit power, for sale at a wholesale rate lower than any other in the country.

First Years Show Steady Progress

From the perspective of June 30, 1941, the first years of the Columbia River program showed a steady progression.

Aside from the construction many years ago of the Celilo Canal, east of The Dalles, Oreg., no concentrated Federal development of the river began until September 30, 1933, when the War Department, under the immediate direction of the U. S. Army Corps of Engineers,

started construction of Bonneville Dam, 40 miles east of Portland, Oreg.

On December 19, 1933, construction of Grand Coulee Dam on the upper river, 90 miles west of Spokane, was undertaken by the Department of the Interior under immediate direction of the Bureau of Reclamation.

Both dams were of the multiple-purpose type: Bonneville for the dual purpose of improving navigation and the generation of hydroelectric power; Grand Coulee, for irrigation and the generation of hydroelectric power.

By 1937, construction at Bonneville was largely complete. The spillway dam had been erected, a mammoth single-lift shipping lock was in operation, and two generating units had been installed in the powerhouse.

In August of that year the Bonneville Power Administration was created by act of Congress as a provisional agency set up for the transmission and sale of Columbia River hydroelectric power.

The Administration's first fiscal year (August 1937 to June 30, 1938) was devoted largely to formation of initial policies and staff organization.

The second fiscal year (July 1, 1938, to June 30, 1939) saw the launching of a basic construction program which involved the design and building of an initial network of high-voltage transmission lines. First funds for construction facilities were appropriated by the Congress in May 1938, and were made immediately available. Actual erection of the first steel tower line began in March 1939.

In the third fiscal year (July 1, 1939, to June 30, 1940) the Administration's first high-voltage transmission lines were completed and energized. By the end of the year's first quarter the first power sales contract had been executed; and during ensuing months sales multiplied rapidly. Staff reorganizations were effected to meet the rising volume of demand for lines and power. At the close of the third year 188,415,993 kilowatt-hours of electricity had been sold to seven agencies of all types.

Growth Great in Fourth Year

It was in the Bonneville Administration's fourth fiscal year (July 1, 1940, to June 30, 1941) that the agency, by virtue of its substantial volume of power sales and deliveries, assumed a major status as a utility enterprise and as a regional institution.

It was during this period that the agency, through its carefully planned sales program, found itself in a key position for determining the role which the Northwest region would play in arming the Nation.

It was during this period that data, resulting from actual opera-

tions records, were available for the first time for accurate analysis of the success of the broad conservation program as mapped by Congress in the statute of 1937.

Finally, it was during this period that the agency's operating function became of equal significance with its planning and construction functions.

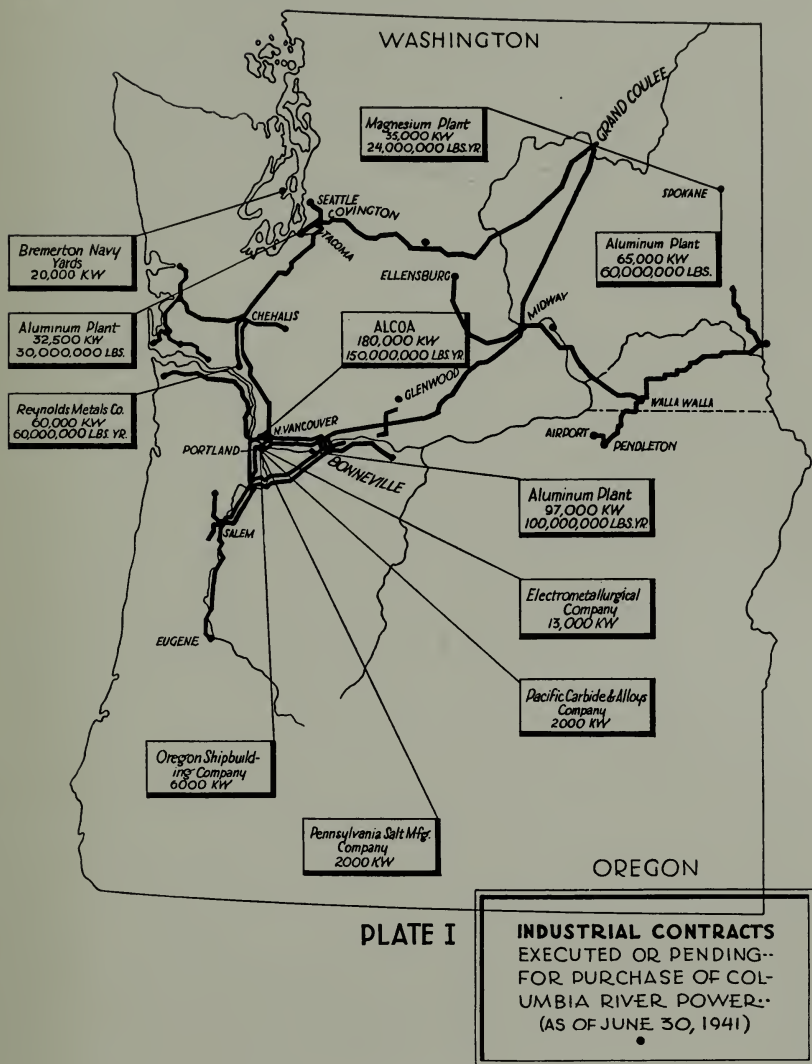
The Defense Contribution

Development of a new northwest industry with which to correct the unbalanced regional economy, which in the past has been too dependent upon agriculture and timber, has long been a fundamental of the Bonneville Administration's conservation program. Before the close of the fiscal year 1940 considerable advance had been made in this direction. A large number of industries had filed applications for power or had made inquiry as to the feasibility of establishing plants within the region. One large aluminum manufacturing firm, during the latter half of the fiscal year 1940, had executed contracts for the purchase of power and was bringing to completion a metal reduction plant as the year closed. Thus, the impact of the defense emergency in September 1940, found the Bonneville Administration ready. (See pl. I.)

Considerable power capacity existed at Bonneville Dam. Additional capacity at both Bonneville and Grand Coulee was on order for delivery within the near future. Basic circuits of a region-wide transmission network were in place. Contracts for the interconnection of the Government's system with the largest municipal utility systems in the region were executed or in final negotiation. All that remained to put the Northwest on a full defense footing was the execution of contracts with new defense industry which already, in large measure, had begun to investigate the Northwest's possibilities. Under the direction of a market development staff, comprising experts in the field of electrometallurgical, electrochemical, and industrial research, this program was vastly intensified during the fiscal year 1941.

As a result of this wide cooperative effort embodying comprehensive industrial research, coordination with Federal defense agencies and regional groups, the Bonneville Administration was able to report on June 30, 1941, a total of 265,500 kilowatts of power under contract for delivery to six first-line defense industries, as follows:

	<i>Kilowatts</i>
Aluminum Co. of America, 3 contracts.....	182, 500
Reynolds Metals Co., 2 contracts.....	60, 000
Oregon Shipbuilding Co.....	6, 000
Electro Metallurgical Co., 2 contracts.....	13, 000
Pennsylvania Salt Co.....	2, 000
Pacific Carbide & Alloys Co.....	2, 000



In addition to these executed contracts, the Administration had applications for industrial power totaling nearly 1 million kilowatts. As the fiscal year came to a close, preliminary negotiations had been undertaken with the Office of Production Management for the establishment of three additional aluminum reduction plants and one magnesium reduction plant early in the calendar year 1942. Tentative plans called for establishment of these plants at Spokane and Tacoma, Wash., and in the lower Columbia gorge in the State of Oregon. The plants were to be financed and constructed by the Government and leased to private companies for operation. Combined output of aluminum in the Northwest, as a result of their completion, was scheduled to reach a total of 400 million pounds annually—approximately 25 percent of the country's entire proposed defense output.

Industrial Planning and National Defense

For greater ease in handling this industrial-defense program, the work of the Market Development Section was divided into two phases. The first was concerned with industrial power development in the Pacific Northwest, both for national defense and for normal peacetime requirements. The second phase was devoted to a variety of economic problems primarily related to long-range planning of the transmission system.

The largest industrial power consumers are the electrometallurgical and electrochemical industries. Normally, the work of the Market Development Section would have been devoted to deliberate investigations of the raw materials required by, and the economic feasibility of, various industries of this group. The national defense emergency accelerated the need for such information and required that the staff meet immediate problems as they currently arose. The Administrator and numerous industrialists were supplied promptly with information on raw materials, processes, and technical problems of such defense industries as aluminum, magnesium, electrolytic zinc, electrolytic chromium, and iron and steel. In addition, industries contemplating locations in the region were provided with data on community resources and plant sites in over 50 cities and towns. A publication completed during the year covering the industrial facilities of 37 communities on the lower Columbia River from The Dalles to Astoria was of material aid to these industries. The significance of this work, both in guiding the policies of the administration and in assisting industries, may be appreciated from the fact that except for the specialized information within the section, there does not exist in the Northwest or elsewhere a centralized and broad body of technical and economic data dealing with the region.

The year saw the following new electroprocess plants initiated, under construction, or completed:

TABLE 1.—New Northwest electroprocess plants established in 1940 and 1941

Name	Location	Products	Regional source of capital	Approximate plant investment ¹	Date power contract signed
Aluminum Co. of America.	Vancouver, Wash.	Pig aluminum..	East.....	\$15,000,000	Dec. 23, 1939
Electro Metallurgical Co. (subsidiary of Union Carbide & Carbon Co.).	Portland, Oreg....	Calcium carbide and ferroalloys.	.....do.....	2,500,000	May 29, 1941
Ohio Ferro-Alloys Co. ² .	Tacoma, Wash.....	Ferroalloys.....	.....do.....	250,000	.....1941
Pacific Carbide & Alloys Co.	Portland, Oreg.....	Calcium carbide	California..	250,000	July 13, 1940
Pennsylvania Salt Co....	.....do.....	Chlorates.....	East.....	400,000	Dec. 18, 1940
Reynolds Metals Co.....	Longview, Wash..	Pig aluminum..	South.....	5,000,000	Feb. 24, 1941

¹ As reported in the press.

² Customer of Tacoma Department of Public Utilities.

Of the above six plants, only one, the Reynolds Metals Co., unquestionably owes its existence to the defense program. The Aluminum Co. of America is reported to have based its initial plans upon normal peacetime requirements, as did the Pacific Carbide & Alloys Co. The other plants are in the class that had been anticipated in the course of the normal power development of the Pacific Northwest, although it is possible that the defense emergency accelerated their inauguration.

At the end of the year, in addition to approval by the Office of Production Management of four additional aluminum plants in the region and one magnesium plant, the Market Development staff was engaged in discussions with some six other electroprocess prospects, at least three of which were known to be based upon normal peacetime markets in and near the Pacific Northwest. With the materialization of the plans of the Office of Production Management plus those industries which had already signed contracts with the administration, it was evident that six new products would contribute some diversification to the present overspecialized economy of the region. These included calcium carbide, ferrochrome, ferrosilicon, chlorates, and magnesium. In the case of aluminum, the Northwest was well on its way to becoming a strategic producing center for the Nation, with a scheduled output above 400,000,000 pounds per year, or approximately 25 percent of the present program of national output.

While it was apparent at the close of the fiscal year that needs of the defense emergency would continue to impose heavy responsibilities upon the staff for additional investigations related to defense plants, work had already begun on the long-run fundamental problems of adjusting the new defense industries of the Northwest into the permanent regional economy. A repetition of unemployment and

the contraction of industry that followed World War I appeared entirely possible in the Northwest unless an aggressive program of investigations could be followed with appropriate policies by the various Federal agencies concerned. In this direction, the Market Development Section increased its efforts.

Obstacles to this work were found to be great. Much more knowledge is needed regarding the extent, quality, and availability of mineral deposits in the region. There is too little private fragmentary information about Northwest iron, magnesite and alunite, and other deposits and too little public authentic information available. Another obstacle to sound diversified industrial development in the Northwest is the restraining influence exercised by certain large corporations in many ways. Some of these control certain western mineral deposits and will develop them only under conditions acceptable to their interests. A number of industrialists have indicated considerable interest in the industrial power opportunities of the region, but they lack formal investigations of these opportunities. Investors and industrialists with moderate capital resources are unable to finance the necessary research on raw materials, markets, and processes. Technical knowledge of many of the electro-process industries is concentrated in the staffs of a few corporations.

As a contribution toward mitigation of these stumbling blocks, the Bonneville Administrator prepared detailed recommendations for presentation to proper authorities.

Principal recommendations included suggestions that governmental agencies be implemented to assist small, as well as large, private and independent enterprises to develop western mineral resources; that new appropriations be made immediately available to prevent delays in Bonneville's 1943 construction program for supplying power to new western industries; and that construction of a new multiple-purpose dam on the Columbia River be undertaken as rapidly as possible.

Specifically the Administrator suggested that the United States Bureau of Mines and the United States Geological Survey receive greater appropriations for mineral explorations in the West. He pointed out that changes in production technology make it necessary to reappraise known mineral deposits from time to time in the light of new discoveries in processing methods. He pointed out that the defense effort makes it imperative that these reappraisals and additional explorations be expedited.

In order to overcome the lack of knowledge of western mineral deposits, the Administrator suggested that the results of all minerals investigations by the Government be more widely publicized and distributed. He also suggested that it "may be that the present authority of the United States Geological Survey and the Bureau of

Mines should be so modified as to permit access by these agencies to any mineral deposits, regardless of ownership."

It was further pointed out that Government agencies should be given adequate financing to conduct exhaustive studies on the feasibility of developing individual mineral deposits.

In order to overcome handicaps suffered by smaller enterprises which lack necessary resources for research, it was recommended that Government research be expanded to cover not only the problems of raw materials and processes, but the problems of marketing, transportation facilities and costs, magnitude of competition and related matters.

Further recommendations included the suggestion that Federal action be taken to facilitate investments in new, even though small, business enterprises.

The continuous planning of the power facilities of the Bonneville Power Administration through the year required constant analysis of changing trends in the economies of the various subregions of the Northwest as they will affect the demand for industrial, commercial, agricultural, and domestic power. The market development staff continued its compilation and analysis of a wide variety of economic data pertaining to these subjects.

As part of the problem of surveying industrial resources and opportunities in different parts of the region and at the same time making this information available to industrialists, the staff issued the first in a series of industrial reports, "The Columbia River Industrial Site Survey." This report proved to have extensive demand among industries, railroads, private utilities, and chambers of commerce. Work during the year continued on similar studies of the Willamette Valley and the lower Puget Sound areas. Through reports of this type, an adequate picture of the industrial facilities of the Northwest was steadily built up, offering for the first time to private business and Government a detailed cross-section analysis of a large region.

System Planning and National Defense

In addition to its heavy power sales to defense and peacetime industry, and in addition to its extensive surveys and correlation of data on the availability of raw products and the feasibility of specific electro-industrial operations within the region, the Bonneville Administration, during the fiscal year, made exhaustive reappraisals of future power needs in the light of the new defense developments. These planning activities were vitally necessary as a basis for determining the direction in which the Government's Northwest grid should be expanded to serve both normal and defense load growth in the period between 1943 and 1948.



BONNEVILLE'S TOWERS OF DEFENSE

Swinging high 'twixt land and sky, daredevil linesmen rushing to completion a high-tension transmission line in the Columbia River Gorge, symbolize the new era of low-cost electric power for home and defense use brought to the Pacific Northwest through the conservation program of the Bonneville Power Administration.

Studies by the System Planning Section directed to this end, supplementary to earlier surveys conducted in the fiscal year ending in 1940, were systematically carried out during the fiscal year 1941. These investigations covered economic trends in the Bonneville-Coulee service area, the load and rate of load growth in the region. From them, a workable program was devised for the installation of generating equipment, transmission lines and substations, so scheduled as to supply a maximum amount of power in the minimum amount of time. Near the close of the year all findings were made available to the Federal Power Commission and to the Office of Production Management.

In conducting these researches, moreover, the System Planning staff, assisted by a staff of outside consulting engineers, kept in mind the necessity for providing a generating and transmission schedule in keeping with a sound and rational long-time conservation program, and at the same time it was constantly necessary to review its findings in the light of rapidly changing defense needs. In the most recent review of its findings, for example, the staff found it advisable to reevaluate all previous power needs of the region in terms of a complex economic setting, a result of the national emergency, in which the establishment of a number of new defense industries in the Columbia River area had brought about an actual and increasing shortage of electrical energy.

Therefore, as the fiscal year closed, the staff concluded that to meet not only the power demands for 1948, but also those of 1943 and 1945 with an adequate and unfailing supply of power, preparations and construction should begin at once if the required generating and transmission facilities were to be brought to completion as rapidly as needed. So imperative appeared the power requirements already existing in the area, it was recommended that a program which earlier had been planned to cover a period extending to 1948 must now be advanced to achieve completion in 1945. The net result of these recommendations would be to advance the Government's hydroelectric power installation schedule in the Columbia River region from 3 to 5 years.

Formulation of the 6-year construction program.—Early in the fiscal year 1941, the System Planning staff worked out a program of construction for the 1942-47 interval. This program, drawn up in conformance with Executive Order No. 8455 and filed with the Bureau of the Budget in September 1940, presented in detail the power demands for the area and listed the generating facilities required at Bonneville and Grand Coulee, together with the transmission facilities necessary to meet the anticipated load. The schedule as formulated at that time reflected the need of the national defense program inaugurated 3 months earlier (June 26, 1940) by the signing of the defense appropriation bill (H. R. 1055).

On March 11, 1941, the President signed the "lend-lease bill" (H. R. 1776). The direct effect of the measure was to advance the entire defense production program to an extent far exceeding all previous estimates. Accordingly, by May 1941, and in the face of rapidly expanding industrial activity throughout the Pacific Northwest, the staff completed a comprehensive report presenting a revised 6-year construction program for the Bonneville Power Administration, and covering the new requirements for hydroelectric power brought about by defense production. By June 1941, this latter report was itself carefully revised and addenda were supplied so as to take into consideration policies formulated very recently by the Office of Production Management, especially with respect to the production of such strategic materials as aluminum and magnesium. Thus, as a result of events of nationwide scope, a schedule had been submitted whereby new generating capacity could be made available as fast as generators could be manufactured and installed, and whereby the program for transmission and substation facilities could be correspondingly accelerated.

Definition of problems involved in the revised 6-year program.—In working out a revised 6-year program reflecting the needs for national defense, the System Planning staff discerned that four basic and closely related problems required analysis. First, there was the broad problem of the present impact and the anticipated future effects of the national defense program on the industrial activity and power requirements of the Pacific Northwest, with special reference to the States of Washington, Oregon, and northern Idaho. The second problem concerned the actual generating capacity of the existing utilities in the region, and the relation of this capacity to the new demands for power brought about by the young defense industries. In other words, there was required an analysis of present power loads in the Bonneville-Grand Coulee service area, together with estimates of the anticipated rate of increase in these loads under the impetus of expanding industrial production. A determination of the additional generating capacity required at Bonneville and Grand Coulee constituted a third problem. Finally, there was needed also a detailed schedule of the necessary transmission facilities during the 1943-48 interval so as to conform with the estimates of power supplies and power demands as already analyzed.

Economic impact of the defense program.—Studies made by the staff of industrial activity in the area revealed that power demands were increasing markedly and at a rate hitherto unknown in the Pacific Northwest. Furthermore, the increase began even prior to the organization of the defense program. This was because low-cost Bonneville power had already attracted certain industries to the area before June 1940. There was every reason to believe that the rise in indus-



NATION'S NEWEST TRADE ROUTE

Ocean-going vessels plying the Seven Seas pass through giant locks at Bonneville to bring greater economic advantage to interior Northwest points, where growing industry benefits by electric power surging over cables such as these swung from steel towers over the Willamette River near Portland, Oreg.

trial power needs would continue even without the stimulation of specific emergency production.

The effect of the defense activities was to hasten and increase the power shortage. The shortage, in fact, became critical when there was superimposed upon expanding peacetime production a number of new manufacturing and industrial enterprises operating under defense contracts. In Oregon and Washington defense contracts alone for the period from June 1940 to March 1941, totaled \$720,606,730. These covered mainly the emergency construction of aircraft, ships, ordnance, barracks, airports and docks. Further studies revealed a corresponding trend, for by the fall of 1940 employment, pay rolls, and department store sales in Oregon and Washington began to rise steadily as a direct result of defense production.

Moreover, the defense program increased in particular the power needs of the new high-current consuming industries employing electrolytic, electrothermal, and electrochemical processes. It was significant, for example, that full operation of the Vancouver, Wash., plant of

the Aluminum Co. of America alone required a volume of power approximately equal to the combined requirements of Seattle and Tacoma in 1939.

The clearest expression, however, of the effect of the national emergency on the power requirements of the region appeared in the rate of increase in the needs of the 12 major utilities operating in the area in 1939. Their power requirements in that year prior to the inauguration of the national program, totaled 1,009,000 kilowatts. In 1940 total requirements had increased 15 percent to 1,166,000 kilowatts. This gave almost incontrovertible support to the estimate that by the end of 1941 the total would rise to approximately 1,528,000 kilowatts, or an increase of 30 percent over 1940 and 51 percent over 1939. This unprecedented rise attained added significance when compared to the 50 percent increase in power requirements in the whole United States from 1914 to 1918, when for 2 years the Nation was at war.

Present load and future load growth in the region.—An examination of the factors contributing to these increasing power demands convinced the staff that a satisfactory load survey for the area must be one which would allow for a maximum of flexibility and permit rapid revision. Therefore, a study was made to determine, first, the expected rate of increase in the power loads of the 12 districts of the area, wherein are found the major operating utilities. Second, owing to the new developments in defense production, a further survey was made of the prospective needs of the new industries operating or seeking to operate in the area.

As a result of investigations made early in 1940, it was known that the major existing utilities had been able in 1939 to supply approximately 92 percent of all the electrical energy required for public use. It was also learned that the annual rate of increase in each of the 12 districts had been fairly uniform. Proceeding on the basis of uniformity, utility loads for the approaching period were estimated to increase in 1942 by 15 percent, in 1943 by 12 percent, in 1944 by 12 percent and in 1945 by 10 percent.

To estimate the present and future outlook for the industrial load, the new industries were subdivided into two categories: Industries already under contract for power; and industries which were engaged in negotiations for power. Here it was found that by May 17, 1941, five industrial establishments in the Puget Sound subregion and in the lower Columbia area had already executed contracts requiring a total of 285,500 kilowatts. In the lower Columbia area alone the contracts called for 246,000 kilowatts during each year in the period 1942-45. Moreover, there were in addition 14 industries engaged in negotiations for contracts. The survey indicated that the total power demand in Oregon and Washington of these plants would reach 402,000 kilowatts in 1945, making a total of approximately

660,000 kilowatts required for new industrial uses in that year. Thus, it was apparent that the demand for power was increasing at a rate far in excess of the normal load growth of the operating utilities.

In order to make large blocks of prime power available by 1943 to the industries expected to sign contracts, the studies pointed to the conclusion that earlier schedules for the installation of generating units and the construction of transmission facilities would need to be markedly accelerated. In fact, only through such a stepping-up of the program could the companies begin successful operation.

To fulfill the demands for Washington, Oregon, and northern Idaho, it was originally estimated that there must be available in 1941 a total of 1,528,000 kilowatts; in 1943 a total of 2,314,000 kilowatts; and in 1945 a total of 2,703,000 kilowatts. However, these figures were later revised when it was learned that the Office of Production Management had set up a regional quota for the production of additional aluminum in an amount which would result in a distinct increase in the power demand. In the revised estimate it was determined that the demand would reach 1,628,000 kilowatts in 1941; 2,746,000 kilowatts in 1942; and 3,135,000 kilowatts in 1945. (See Plate II.)

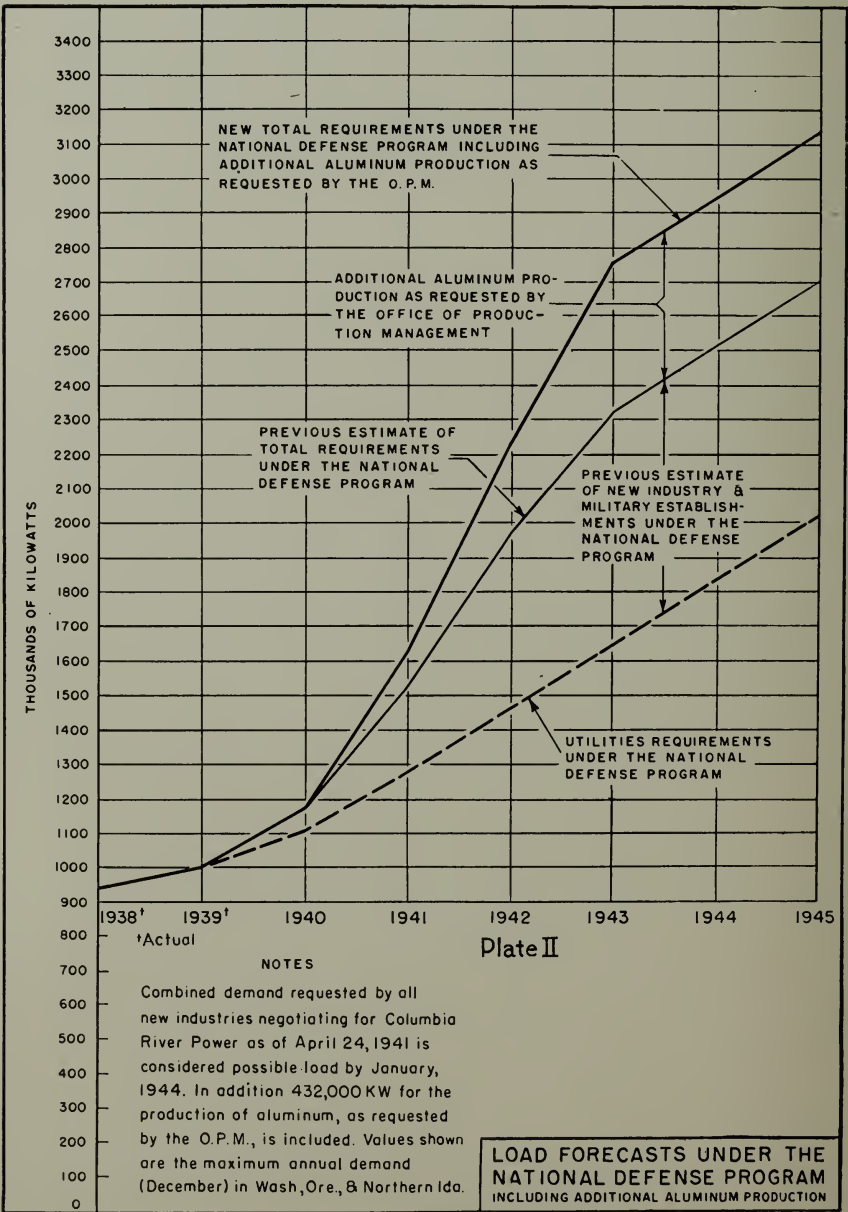
Detailed studies were likewise completed to show in what load districts the greatest increase might be expected. Here it was foreseen that loads in the Portland district would be $3\frac{3}{4}$ times the 1939 value, while the Seattle-Tacoma, Spokane, Eugene, and Klamath Falls district would more than double by 1945. For the entire region the 1945 requirements were indicated to exceed those of 1939 by $2\frac{1}{2}$ times.

Required additional generating capacity in the Federal system.—Succeeding investigations, supplemented by field inspections, were carried out to determine the actual limitations upon the operations of the existing generating plants in the area. In the eight districts in Washington and Oregon, but excluding the Bonneville-Grand Coulee system, the available capacity of existing plants without counting their reserves was found to be 1,062,000 kilowatts. However, according to detailed estimates based on annual maximum demand, in 1941 there would exist a deficiency in the generating capacity of the utilities of 446,000 kilowatts, and in 1943 the deficiency would reach 1,252,000 kilowatts. A total deficiency of 1,641,000 kilowatts was forecast for 1945.

The above estimates, of course, were considered in relation to the data indicating that the Pacific Northwest must be prepared to meet a maximum demand for power in 1941 of 1,628,000 kilowatts, of 2,746,000 kilowatts in 1943, and 3,135,000 kilowatts in 1945. Considering in their computations the available capacity of the existing plants, it was found that the additional load in the area must be met by the Federal system, which must be ready to supply 566,000

kilowatts of firm power in 1941, 1,684,000 kilowatts in 1943, and 2,073,000 kilowatts in 1945.

To meet these demands, a schedule was worked out for the installation of generators at Grand Coulee and Bonneville. All of the 10 units at Bonneville having already been authorized, the new schedule called for their completion by 1943. Four were in operation by the



close of the fiscal year 1941. The fifth and sixth units were to be installed in August and December 1941. The last 4 units were scheduled for completion in 1943.

At Grand Coulee six units had been authorized by the close of the year. The first was to be completed in September and the second in December 1941. The third was to be completed in April 1942, and the remaining three units in about 2 years. Combined capacity of these first three units at Grand Coulee was scheduled to bring the combined capacity of Bonneville and Coulee to 680,400 kilowatts by April 1942. However, as load studies had already indicated that there would be a deficiency of 910,000 kilowatts in 1942, exclusive of the Federal system, a power shortage would necessarily continue unless further installations at Grand Coulee could be authorized and completed.

It was found, however, that by stepping up installation to correspond with load requirements, the proposed capacity for Bonneville and Grand Coulee could be brought to 1,166,000 kilowatts by 1943, leaving a deficiency in that year of only 86,000 kilowatts. Moreover, by further accelerating the installation schedule for Grand Coulee it was estimated that the deficiency would be eliminated in 1944.

To this end, the System Planning Section prepared a revised program for installations at Grand Coulee. According to this new schedule, it was recommended that units at Grand Coulee originally planned for completion by 1945 be advanced to 1943, and those previously scheduled for installation by 1948 be advanced to 1945. This can be accomplished only by simultaneous installation of units in *both* the "left" and "right" powerhouses at Grand Coulee. In detail, the recommended schedule of generator installation follows:

TABLE 2.—Revised recommended schedule of generator installations

Date of installation	Units added		Total installed capacity (kilowatt)		
	Bonneville	Grand Coulee	Bonneville	Grand Coulee	Total
Existing as of—	<i>Numbers</i>	<i>Numbers</i>			
June 1, 1941.....	1-4, inc.....		194,400		194,400
Aug. 1, 1941.....		L3.....	194,400	108,000	302,400
Aug. 18, 1941.....	5.....		248,400	108,000	356,400
Dec. 1, 1941.....		L2.....	248,400	216,000	464,400
Jan. 1, 1942.....	6.....		302,400	216,000	518,400
Mar. 1, 1942.....		L1.....	302,400	324,000	626,400
January 1943.....	7 ¹		356,400	324,000	680,400
July 1943.....	8 ¹	L4 & R1.....	410,400	540,000	950,400
September 1943.....	9 ¹	L5 & R2.....	464,400	756,000	1,220,400
November 1943.....		L6 & R3.....	464,400	972,000	1,436,400
December 1943.....	10 ¹		518,400	972,000	1,490,400
January 1944.....		L7 & R4.....	518,400	1,188,000	1,706,400
March 1944.....		L8.....	518,400	1,296,000	1,814,400
May 1944.....		R5.....	518,400	1,404,000	1,922,400
September 1944.....		L9.....	518,400	1,512,000	2,030,400
March 1945.....		R6.....	518,400	1,620,000	2,138,400

¹ Delivery of Bonneville generator units Nos. 7 to 10, inclusive, can probably be advanced from 30 to 60 days by the payment of overtime and the securing of necessary priorities.

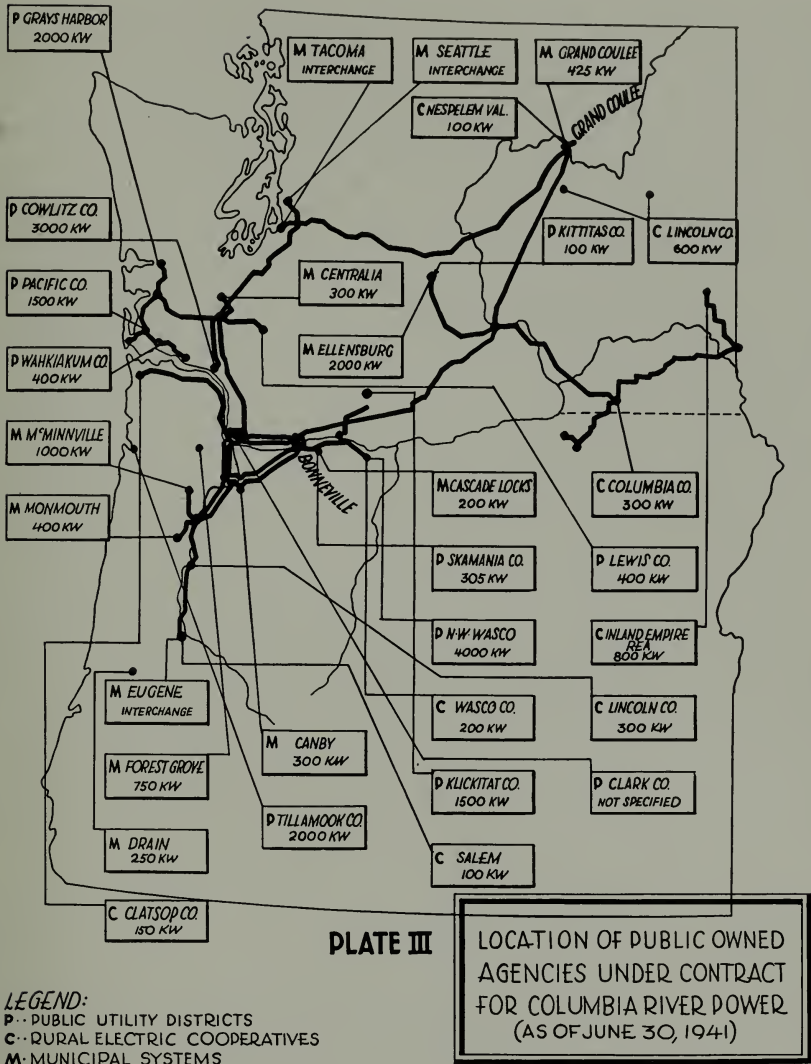
In summary, it can be said that during the fiscal year 1941 the Bonneville Administration maintained firm consciousness of its role in aiding defense production in the Pacific Northwest. The need for careful planning, always important in any broad conservation program, was met as fully as possible in connection with the agency's adjustment to the defense effort. Basic plans were modified to fit the new need wherever required, and effort was made to complete the revisions and to present recommendations to defense leaders at dates sufficiently early to insure proper consideration and effective action.

Sales to Public Agencies

Demand for Columbia River power by public owned distribution agencies, such as cooperatives, municipalities and public utility districts, continued to grow during the fiscal year 1941. Continued strength of the public ownership movement in the Pacific Northwest was evidenced by the fact that 44 local utility districts had been formed under the Oregon and Washington statutes by the close of the year. In addition to this, rural electric cooperatives, financed for the most part by Rural Electrification Administration funds, and municipally owned power distribution systems had reached a total of 90 in the two States. This evidence of steady growth of the public ownership movement came about despite the bitter and well-organized opposition of private utilities.

Principal progress from the standpoint of the number of projects placed in operation during the year lay with the rural electric cooperatives. However, substantial gains were made during the period by the utility districts, especially in the State of Washington. By the close of the fiscal year 1941, 11 such districts had begun power distribution, 45 cooperatives were in actual operation and 35 municipalities were in business for themselves.

It was in the development of the public utility districts that the major problems presented themselves. Principal problems centered about the acquisition of lines and substations by the districts. In numerous cases districts had been formed by local election under the impetus of a necessity for lower electric rates and for a wider distribution of the benefits of electricity to rural areas. Once formed it was necessary to issue bonds and to negotiate for existing privately held systems within the district boundaries or to plan the construction of new systems. These latter two procedures were fraught with legal and financial difficulties. In some cases the companies owning existing distribution systems were unwilling to sell. In other cases the cost of purchasing the local portion of a large regional utility property carried the handicap of heavy severance damages. In some cases, where the privately owned system to be purchased was small and not



part of a larger integrated system, these problems were readily solved. In a number of other cases it was necessary for the districts to embark upon lengthy condemnation proceedings in order to establish a fair purchase price—proceedings which in a number of instances had not been terminated as the fiscal year drew to a close.

In order to fulfill the principles of the Bonneville Act, the Bonneville Administration undertook, at the beginning of the year, to give public utility districts such aid as was legally feasible in the acquisition of their distribution systems. In response to requests by groups of district commissioners, the Bonneville Administrator consented to act

as their representative in negotiations for the system-wide purchase of privately owned utility properties, with a view to obviating the necessity of severance damages through system-wide purchases. To this end the administration set up an acquisition staff which concerned itself with appraising various facilities of private utilities which might become a part of the Bonneville system and which the districts proposed to acquire.

As the year drew to a close substantial progress in negotiations for several systems had been made. In two cases joint acquisitions had been consummated, the local utility districts involved taking over the companies' distribution systems and the Power Administration acquiring the transmission lines for incorporation into its own Northwest transmission grid.

To further facilitate the acquisition of privately owned utility systems, the Department of the Interior, on the advice of the Power Administration, had explored the possibility of obtaining the cooperation of the Reconstruction Finance Corporation in financing the purchase of several large utility systems in behalf of the local districts.

In detail, power sales by the administration to public-owned distribution agencies of all types showed a substantial increase during the year. Of 44 power contracts executed, 31 were with public distribution agencies. Of these, 11 were with public utility districts, 12 were with municipally owned systems, and 8 were with rural electric cooperatives. (See Plate III.) Power sales to agencies of this type, on the basis of contracts executed, totaled nearly 30,000 kilowatts. Following is a list of power sales contracts with public agencies in force at the close of the fiscal year 1941:

TABLE 3.—Public utility districts

Name	Number of kilowatts	Date executed	Name	Number of kilowatts	Date executed
Skamania.....	305	Aug. 2, 1939	Northern Wasco.....	4,000	Oct. 28, 1940
Pacific.....	1,500	Oct. 5, 1939	Grays Harbor.....	2,000	Nov. 7, 1940
Wahkiakum.....	400	Oct. 10, 1939	Clark.....	(1)	Apr. 17, 1941
Klickitat.....	1,500	Dec. 5, 1939	Cowlitz.....	3,000	Apr. 28, 1941
Tillamook.....	2,000	May 15, 1940	Total.....	15,205	
Kittitas.....	100	Oct. 3, 1940			
Lewis.....	400	Oct. 4, 1940			

MUNICIPALITIES

Cascade Locks.....	200	Feb. 14, 1939	Seattle.....	(2)	May 6, 1940
Forest Grove.....	750	Nov. 7, 1939	Ellensburg.....	2,000	Aug. 1, 1940
Canby.....	300	Dec. 22, 1939	Eugene.....	1,500	Aug. 20, 1940
Monmouth.....	400	Jan. 4, 1940	Drain.....	250	Mar. 15, 1941
McMinnville.....	1,000	Jan. 13, 1940	Grand Coulee.....	425	May 1, 1941
Centralia.....	300	Feb. 13, 1940	Total.....	7,125	
Tacoma.....	(2)	Feb. 23, 1940			

COOPERATIVES

Oregon 4 Lincoln.....	300	June 27, 1940	Washington 39 Nespelem...	100	Feb. 19, 1941
Washington 20 Columbia...	300	Oct. 1, 1940	Salem Electric Co-operative...	100	Mar. 17, 1941
Oregon 26 Wasco.....	200	Oct. 2, 1940	Washington 37 Lincoln.....	600	May 1, 1941
Washington 18 Spokane.....	800	Oct. 3, 1940	Total.....	2,550	
Oregon 5 Clatsop.....	150	Oct. 7, 1940			

¹ Not specified.² Interchange.

Of principal significance in the year's program affecting power distribution through public agencies was the performance record made by these agencies in the distribution of Columbia River power. By the close of the year a total of nine such agencies had been receiving and distributing Government-generated electricity for periods ranging from 6 to 18 months. The record of these operations was the first definitive measure of the success of the ownership program delineated by the Bonneville Act. It offered the first substantial body of fact on which scientific analysis of the public power program from generator to ultimate consumer could be based.

From the day each of these power distribution agencies began distributing Columbia River energy, analysts and engineers of the Power Administration's Rates and Statistics and Project Operations staffs maintained a close observation of all financial and other operating procedures. Monthly records were kept of per capita power use within each community served, of monthly billings, of operations costs, of depreciation and amortization costs, and of disposition of net revenues.

All nine of the distribution agencies had subscribed to principles of operation suggested by the Bonneville Administration. These principles provided that in each case revenues from power sales would be used, in the order named, for payment of all current operating expenses, including salaries, wages, cost of materials and supplies, power at wholesale, taxes and insurance; for payment of interest due on system indebtedness and for debt amortization charges; for replacement of plant, contingencies and cash working capital; and for surplus which should be used as a basis for reduction of rates.

For the convenience of these distribution agencies, the Power Administration had suggested a basic retail rate structure which accurately reflected the savings made possible by Bonneville's low wholesale rate, plus necessary margins to cover all operations, including payments in lieu of taxes which ordinarily would have been paid were the systems privately operated. These rates, in cases where system indebtedness was low, were adopted without change. In cases where systems had recently been purchased small surcharges were added to cover amortization costs.

In all cases distribution agencies purchasing Columbia River power were urged to operate their systems in accordance with well established, conservative, fiscal practices.

The performance record by these nine publicly owned agencies at the close of the fiscal year 1941 proved gratifying to the administration. Without exception the cost of power to the retail customers on these systems was reduced, in some cases as much as 50 percent—an unusual record for first-year operation.

The city of Cascade Locks, Oreg., was the first to distribute Co-

lumbia River power through its municipal system. It began operations in August 1939, and in the following November made substantial rate reductions. In the subsequent months, until June 30, 1941, total rate reductions reached an average of 31 percent. In spite of this, as a result of increased power use per customer, the city maintained its total revenue from power sales.* Domestic power users more than doubled their monthly consumption of electricity with only a 4 percent increase in their monthly billings.

The municipal system of Forest Grove, Oreg., became the second Columbia River power distributor on November 27, 1939. By the close of the fiscal year 1941 rate reductions at Forest Grove ranged from 35 to 40 percent. As with Cascade Locks, heavy increases in power use resulted in no decline in total revenues to the city system.

The Canby, Oreg., municipal plant began its operations under a Bonneville power contract on February 1, 1940. Already a highly successful municipal operation, the savings resulting from Columbia River power permitted the city to reduce its rates until for liberal users of electricity they were the lowest in the United States. Reductions made possible by power purchase from the Government have averaged 44 percent.

Skamania County public utility district began distribution of Columbia River power in January 1940. After a series of retail rate reductions, the district reported that in the last 6 months of the fiscal year 1941 revenues from its power sales had increased by 15 percent.

The municipal system of McMinnville, Oreg., purchased Columbia River power on January 13, 1940. The purchase enabled it to make an immediate rate reduction of 27 percent, and during the fiscal year 1941 its retail power sales jumped 24 percent.

Wahkiakum County and Pacific County districts in southwestern Washington reported similar progress. Following its first deliveries of Columbia River power the Wahkiakum district made an initial residential rate reduction of about 10 percent, which resulted in an 18 percent increase in its power sales. The Pacific County district, following rate reductions averaging 25 percent, incurred no reduction in monthly revenues and increased its power sales in 1941 by 50 percent. The Pacific County district was able during the year to bring power service to 800 families which never before had had the benefits and conveniences of electricity.

Other Power Sales

Under the terms of the Bonneville Act power sales activities for the year were, of necessity, confined almost wholly to industry and to publicly owned distribution agencies. In order to relieve power shortages in certain areas served by privately owned utility com-

panies, it was considered consistent with sound policy to execute temporary contracts to supply power to the companies involved. Contracts covering such agreements were written for periods of not more than 2 years. One such contract was in force during the year with the Portland General Electric Co., which serves the city of Portland and certain sections of the Willamette Valley, and the Pacific Power & Light Co., which serves communities in eastern Oregon and Washington and in the Clatsop County, Oreg., area. Through execution of these contracts immediate power shortages in the Portland and Astoria, Oreg., districts were forestalled. Other power contracts involving interchange and power transfer agreements were in force between the Power Administration and the Northwestern Electric Co. and the West Coast Power Co.

Revenue from all power sales mounted rapidly during the year. Total income from power sales during the previous year had been \$367,970. Completion of the huge Aluminum company plant near Vancouver, Wash., and the start of power distribution by numerous public agencies during the year increased power revenues for the fiscal year 1941 to a total of \$1,874,332.

At the close of the year, it was evident from a study of contracts executed and in negotiation that revenues from power sales during the fiscal year 1942 would approximate \$6,400,000.

A month-by-month statement of power revenues during the 12 months ended June 30, 1941, follows:

TABLE 4.—Kilowatt-hour sales and revenues, fiscal year 1941

	Kilowatt-hours	Revenue
July 1940.....	34, 893, 640	\$79, 922. 57
August 1940.....	37, 489, 220	86, 031. 13
September 1940.....	41, 012, 250	94, 209. 44
October 1940.....	49, 414, 475	110, 064. 66
November 1940.....	37, 844, 645	87, 422. 06
December 1940.....	59, 973, 869	131, 744. 80
January 1941.....	70, 303, 284	157, 711. 50
February 1941.....	68, 315, 235	164, 014. 39
March 1941.....	79, 848, 362	170, 572. 94
April 1941.....	101, 432, 167	220, 269. 51
May 1941.....	123, 606, 714	263, 090. 93
June 1941.....	144, 427, 994	309, 268. 50
Total.....	848, 561, 855	1, 874, 322. 43

Bonneville as an Operating Agency

Extensive power deliveries, as well as power sales, to all classes of customers during the fiscal year 1941 put the Bonneville Power Administration in a major position as an operating utility enterprise.

Operations as distinct from sales, construction, and planning had begun in a relatively small way during the preceding fiscal year; but

with the completion of plants by industrial consumers and the acquisition of distribution systems by public agencies, operations services had developed in major volume by June 30, 1941. This activity required the development of an operations staff to fill three principal functions.

First, it was necessary to develop personnel and procedures for transmission line and substation maintenance, for power dispatching and control, and for the emergency service necessary with the occurrence of system outage. This function was made the responsibility of an Operations Section of the Engineering Division. Second, it was necessary to maintain a research and consulting staff to give technical service and advice to the administration's customer systems on such mutual operating problems as accounting procedures, rate-making and distribution engineering. This function was made the responsibility of a Project Operations Section under the supervision of a principal electrical engineer. Third, it was necessary to establish an advisory and consulting service for the agency's wholesale customers in the planning of load building campaigns and procedures. This service was made the responsibility of a power utilization unit within the Project Operations Section.

Major developments in the operation of the physical transmission system during the fiscal year included the establishment of mobile line patrols equipped with short-wave radio, the design and initial installation of carrier telephone service over major lines of the system, and the development of procedures for emergency break-down relief on all parts of the transmission network.

Advisory service by the Project Operations Section was given during the year to nearly every customer on technical operating problems both engineering and fiscal. A small staff of statisticians was maintained to aid the newly established utility districts and other agencies in the establishment and maintenance of reporting procedures on all phases of their activities. Reports from such customer agencies were carefully analyzed each month by the statistical staff with a view to correcting any weaknesses and suggesting methods for more efficient operation.

The utilization staff was instrumental during the 12-month period in suggesting to the administration's customer agencies numerous methods for increasing the use of domestic and farm power appliances as a means of increasing consumption of electricity in the areas involved. Considerable success was obtained with the small municipal systems in increasing local sales of electric ranges, electric water heaters, refrigerators, milking machines, irrigation pumps, and similar appliances. Experimental work was done in cooperation with two municipal systems in testing the efficiency and cost of heating homes with low-cost power.

The Construction Program

By June 30, 1941, the Bonneville Power Administration had 1,176.8 miles of transmission line energized and in service. Twenty power substations also had been energized. With this progress the agency found itself in a position to render service to nearly every major power load center in the States of Oregon and Washington. More than 1,000 miles of the system and 17 of the substations had gone into service during the year. Completion of this program made it possible for the administration to supply electricity to major communities on the Oregon and Washington seacoast, to the cities of the Puget Sound area, to the Yakima Valley in Washington and the Willamette Valley in Oregon, to certain parts of eastern Washington and to the central and lower Columbia River Valley.

During the year interconnections were completed between the Bonneville network and the large municipal power systems of Seattle and Tacoma. Interconnections also were effected with municipal systems in the Willamette Valley, Oreg., and with public utility district systems in western Washington.

As of June 30, 1941, the Bonneville transmission network comprised 459.8 miles of top capacity line constructed to carry power at 230,000 volts, and 471.1 miles of 115,000-volt construction. Miscellaneous lower voltage lines, constructed primarily for service connection purposes, totaled slightly more than 200 miles.

The following tables list the substations and transmission circuits placed in service during fiscal 1941:

TABLE 5.—Substations placed in service during fiscal year 1941

Substation	Size	Date	Customers served
	<i>Kilovolts</i>		
Alcoa	115	Aug. 31, 1940	Aluminum Co. of America.
Albany (additions)	115	Oct. 12, 1940	Benton-Lincoln Electric Cooperative.
McMinnville	57	Oct. 18, 1940	City of McMinnville.
Raymond	115	Oct. 30, 1940	Grays Harbor, Pacific Co., and Wahkiakum PUD.
Eugene	115	Nov. 28, 1940	City of Eugene.
Monmouth	12.45	Dec. 5, 1940	City of Monmouth.
St. Johns	115	Dec. 13, 1940	Pacific Carbide, P. G. E., Oregon Shipbuilding Corporation.
North Bonneville	230	Dec. 22, 1940	Skamania County PUD.
Forest Grove (additions)	22	Dec. 30, 1940	City of Forest Grove.
Chehalis	230	Jan. 1, 1941	Lewis County public utility division.
Midway	230	Mar. 22, 1941	Northwest Electric Co. and Washington Water Power Co., interchange.
The Dalles	115	May 24, 1941	Wasco Electric Cooperative, Inc.
Ellensburg	115	May 27, 1941	City of Ellensburg, Kittitas County PUD.
Walla Walla	115	June 1, 1941	Columbia County Rural Electrification Administration.
Pendleton substation	69	.....do.....	
Pendleton Airport	12.45	June 2, 1941	U. S. Army airport.
Astoria	115	June 30, 1941	Nehalem Valley Electric Cooperative, Pacific Power & Light.

NOTE.—Cities of Forest Grove and Canby served through interconnection with P. G. E. Seattle City Light interchange made through temporary facilities at Covington substation. Tacoma interchange will be put in service upon completion of facilities at Covington substation.

TABLE 6.—Transmission lines placed in service during fiscal year 1941

Line	Size	Date	Miles
	<i>Kilovolts</i>		
Bonneville-Grand Coulee.....	230	Aug. 4, 1940	234.0
Vancouver-Alcoa double circuit.....	115	Aug. 31, 1940	8.4
Salem-Albany.....	115	Oct. 12, 1940	23.7
Salem-McMinnville.....	57	Oct. 18, 1940	21.7
Chehalis-Raymond.....	115	Oct. 30, 1940	45.5
Raymond-Cosmopolis.....	22	do.....	18.3
Vancouver-Chehalis.....	230	do.....	71.7
Condit-Glenwood.....	12.45	Nov. 6, 1940	22.6
Albany-Eugene.....	115	Nov. 28, 1940	39.8
Salem-Monmouth.....	12.45	Dec. 5, 1940	13.7
North Vancouver-St. Johns (No. 2).....	115	Dec. 13, 1940	7.1
Bradford Island Crossing No. 3.....	230	Dec. 22, 1940	.7
Chehalis-Centralia.....	66	Jan. 1, 1941	11.1
Chehalis-Covington.....	230	Mar. 9, 1941	69.4
Covington-Tacoma.....	115	do.....	13.1
Chehalis-Mossy Rock.....	66	May 1, 1941	25.7
Oregon Shipbuilding Service.....	11.5	May 23, 1941	1.3
Bonneville-The Dalles.....	115	May 24, 1941	38.7
Covington-Seattle.....	230	May 25, 1941	11.2
Midway-Ellensburg.....	115	May 27, 1941	64.1
Midway-Walla Walla.....	115	June 1, 1941	81.2
Walla Walla-Pendleton.....	69	do.....	39.3
Pendleton Airport Line.....	12.45	do.....	5.2
St. Johns-Astoria.....	115	June 30, 1940	84.2
Rehabilitation west coast property.....		Oct. 30, 1940	82.8
Total.....			1,034.5

Management of the Enterprise

Speed-up of the entire Columbia River power program from 3 to 5 years, as a result of the imposition of national defense demands upon an already swiftly moving program, required extreme vigilance in the adaptation of management procedures during the fiscal year 1941. In the previous year considerable headway had been made in streamlining production schedules, the conversion of funds, inventory operations and movement of materials and supplies. The defense effort brought more new problems, such as the operation of priorities and the need for revision in construction schedules, which added greatly to the complexity of administration. Establishment of a management office during the 1940 fiscal year enabled the agency to meet these new complexities as they arose. A small staff of business analysts maintained close scrutiny of all procedures and during the year found ways to revise or eliminate or combine many of the agency's procedures in the light of new conditions.

Through the operation of time studies and a system of follow-up reports on all activities, all operations were maintained at schedule. New records were set as a result of improved procedures in the procurement of implements and materials. Particular attention was given to speeding field operations by decentralization of control through the use of branch offices located through the transmission area.

By the close of the year the management office was able to report an increase of 67 percent over the previous year in the processing of funds.

The vastly augmented construction program was reflected in the steady increase in the number of employees, an increase confined for the most part to the Engineering Division.

At the close of the fiscal year 1940 the agency had a total of 2,421 employees. At the close of 1941 the number had increased to 3,189. Of this number, 847 were laborers employed on work in connection with the construction program, 1,725 were civil-service appointees and 102 held professional, consultant or expert positions. Of the entire personnel, all but 28 employees were residents of Oregon, Washington, Idaho, or California.

Financial and accounting procedures also were further perfected during the fiscal year 1941. The financial or general ledger accounts were kept in accordance with the requirements of the General Accounting Office, and the detailed records incident to construction, operation and maintenance activities were kept in accordance with the Federal Power Commission's uniform system of accounts. Progress was made in further harmonizing the two very different methods of accounting required under existing laws and regulations. Consistent effort was made to reduce added expenditures incident to the harmonization of the two types of accounting.

A comparative income statement showing yearly and cumulative totals to June 30, 1941, follows:

TABLE 7.—Department of the Interior, Bonneville Power Administration, comparative income statement

	Cumulative to June 30, 1939, adjusted	Cumulative to June 30, 1940, adjusted	Cumulative to June 30, 1941	12 months fiscal year 1940 adjusted	12 months fiscal year 1941	Increase in fiscal year 1941
Electric operating revenue:						
Commercial and industrial sales		\$274.80	\$1,088,932.42	\$274.80	\$1,088,707.62	\$1,088,432.82
Sales to public authorities for redistribution		12,347.03	130,197.09	12,347.03	117,850.06	105,503.03
Sales to other electric utilities		405,113.55	1,072,390.70	405,113.55	667,277.15	262,163.60
Other sales to public authorities			254.37		254.37	254.37
Customers' forfeited discounts and penalties			120.02		120.02	120.02
Miscellaneous electric revenues		— .32	— .32	— .32		.32
Total operating revenue ¹		417,735.06	2,291,944.28	417,735.06	1,874,209.22	1,456,474.16
Operating revenue deductions:						
Operating expenses						
Transmission expense	\$1,490.69	46,798.61	264,202.01	45,307.92	217,403.40	172,095.48
Customers' accounting and collecting expense	122.02	3,788.10	12,358.49	3,666.08	8,570.39	4,904.31
Sales promotion expense			62,980.80		62,980.80	62,980.80
Administrative and general expenses ²	254,207.43	444,952.48	725,917.92	190,745.05	280,965.44	90,220.39
Total operating expenses	255,820.14	495,539.19	1,065,459.22	239,719.05	569,920.03	330,200.98
Depreciation ³	824.73	13,951.83	92,835.79	13,127.10	78,883.96	65,756.86
Total operating revenue deductions	256,644.87	509,491.02	1,158,295.01	252,846.15	648,803.99	395,957.84
Net operating revenue	—256,644.87	—91,755.96	1,133,649.27	164,888.91	1,225,405.23	1,060,516.32

See footnotes at end of table.

TABLE 7.—Department of the Interior, Bonneville Power Administration, comparative income statement—Continued

	Cumulative to June 30, 1939, adjusted	Cumulative to June 30, 1940, adjusted	Cumulative to June 30, 1941	12 months fiscal year 1940 adjusted	12 months fiscal year 1941	Increase in fiscal year 1941
Income deductions:						
Interest on long-term debt ¹	45,572.68	295,677.97	861,005.62	250,105.29	565,327.65	315,222.36
Interest charged to construction—credit ²	17,570.13	219,466.53	566,196.81	201,896.40	346,730.28	144,833.88
Miscellaneous income deductions.....		10,286.33	94,991.37	10,286.33	84,705.04	74,418.71
Total income deductions.....	28,002.55	86,497.77	389,800.18	58,495.22	303,302.41	244,807.19
Net income.....	-284,647.42	-178,253.73	743,849.09	106,393.69	922,102.82	815,709.13

GENERAL NOTES.—This statement does not reflect the cost of electric energy delivered into the Bonneville Power Administration transmission system by either the U. S. Army Engineer Corps from Bonneville Dam or the Bureau of Reclamation from Grand Coulee Dam. The U. S. Army Engineer Corps delivered 34,202,833 kilowatt-hours in the fiscal year 1939; 208,571,138 kilowatt-hours in the fiscal year 1940; and 894,184,700 kilowatt-hours in the fiscal year 1941. The Bureau of Reclamation delivered 7,455,000 kilowatt-hours in the fiscal year 1941. This statement does not reflect a contingent revenue of \$182.25 resulting from interchanges of power.

¹ Does not agree with the amount shown on comparative revenue statement by \$120.02, forfeited customers' discounts and penalties, and \$0.32 which represents loss on an emergency sale of poles to a municipality due to failure to include stores handling on the bill.

² The difference in administrative and general expenses for the fiscal year 1940 as shown in this statement as compared with those shown in the 1940 annual report results from the capitalization of laboratory equipment charged to expense in error in 1940.

³ Depreciation for the fiscal years 1939 and 1940 has been adjusted to reflect the depreciation accrual applicable to those years. Depreciation has been temporarily established on a straight-line basis, pending determination of the most suitable method of computation.

⁴ "Interest on long-term debt" is the interest applicable to the total expenditures of the Bonneville Power Administration at 2.4 percent per annum on a dollar-month basis. The fiscal year 1939 and 1940 income statements have been adjusted to reflect the interest applicable to each of those fiscal years. The Bonneville Power Administration does not pay interest, but its rates are established with the view of repaying interest on the investment as well as amortizing the investment. This fact, coupled with the Administration's desire to keep records comparable to those of private industry, has led to reporting this item as an income deduction.

⁵ "Interest charged to construction-credit" represents the amount of interest which has been capitalized by the application of interest at 2.4 percent per annum on construction work in progress on a dollar-month basis. The fiscal year 1939 and 1940 income statements have been adjusted to show the "interest charged to construction-credit" applicable to each of those fiscal years. (See Note 4.)

Division of Power

ABE FORTAS, Acting Director

THE DIVISION OF POWER was established on April 18, 1941, by executive order of the Secretary, No. 1563, which reads in part: "There is hereby created in the office of the Secretary a Division of Power which shall have supervision over all the functions in connection with electric power matters in the Department of the Interior, the study of power problems, and the coordination of power policies and activities within the Department and with other agencies dealing with power."

Organization and Scope

The Division was established in immediate response to the increasing problems presented by the national defense emergency, which accentuated a long-felt need for a staff of experts through which the Secretary could clear matters of all kinds relating to the power projects under the jurisdiction of the Department and its various bureaus.

In the 2½ months of the fiscal year 1941 during which it was in existence the Division of Power, in cooperation with the other divisions and bureaus of the Department, established procedures for handling the variety of power matters for the Office of the Secretary. These matters include the many problems related to the power projects of those agencies of the Department having authority to construct and operate power facilities. In addition, they include the responsibility of the Department, as the conservation agency of the Government, to report on the effect upon the country's resources and its public reservations of power developments for which licenses are sought from the Federal Power Commission. As a large consumer of power, the Department also has problems for the Division; the Park Service particularly requires great quantities of electric energy throughout the country, most of which is purchased by contract from power producers. Finally, the Division is concerned with miscellaneous power matters such as those arising in connection with the

Department's administration of islands and territories, and with the congressional mandate that the Secretary of the Interior must assure compliance by the city of San Francisco with the terms of the Raker Act.

Foremost among the bureaus of the Department having authority to construct and operate power projects is the Bureau of Reclamation which since its first power installation 35 years ago has been building some of the largest power projects in the world. The Indian Office and the Park Service have also built and operated power facilities on lands under their respective jurisdictions. The Bonneville Power Administration, which was placed by Congress under the Secretary of the Interior, was established to construct and operate a tremendous transmission network for the marketing of the power from the Bonneville Dam built by the Corps of Engineers of the Army. By the Executive order of the President, August 26, 1940, the marketing of the surplus power from the Grand Coulee Dam built by the Reclamation Bureau was turned over to the Bonneville Power Administration. The marketing of power developed at the Fort Peck Dam now under construction by the Corps of Engineers has also been placed in the Department, under the supervision of the Bureau of Reclamation, by the Congress, in the Fort Peck Act of May 18, 1938.

Power for Defense

With jurisdiction over the Bonneville project and the power installations on 17 Reclamation projects (including Boulder and Grand Coulee) as well as developments under the Office of Indian Affairs and the National Park Service, the Department is now concerned with the output of over 1,228,977 kilowatts of installed capacity. Projects under construction and authorized, including the Fort Peck development, will add another 2,221,100 kilowatts in the next few years, making a total of 3,450,077 kilowatts. This amount of power is approximately 60 percent of the total present hydro and steam installations, other than Federal, in the 13 Western States of Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, North Dakota, Oregon, South Dakota, Utah, Washington, and Wyoming. An additional installation of 1,500,000 kilowatts contemplated for defense purposes over that now in operation and authorized would make the Department's power projects approximately equal all the present non-Federal power installations in those States.

When the need for additional power for the production of aluminum and magnesium was seen to be acute in the spring of 1941, the Division of Power, with the aid of the Bureau of Reclamation and the Bonneville Power Administration, worked out a program with the Office of

Production Management for making use of the Department's power resources in a comprehensive plan for the production of light metals in Government-owned plants. The Office of Production Management requested sufficient additional power from the Boulder Dam development to enable the construction of a plant in Nevada to produce 112,000,000 pounds of magnesium metal annually. In addition, power from the Columbia River developments was set aside for three additional aluminum plants with an aggregate capacity of about 180,000,000 pounds of the metal annually, and another magnesium plant of 24,000,000 pounds annual capacity. The Division of Power was further charged with the effort, in cooperation with the Bureau of Reclamation, to make available from the Parker and Davis developments certain other large blocks of power for additional magnesium plants in the California-Nevada-Arizona area.

Summary of power installations, present and authorized

	Installations as of July 1, 1941	Additional authorized and under construction	Total
	<i>Kilowatts</i>	<i>Kilowatts</i>	<i>Kilowatts</i>
Bureau of Reclamation.....	993,962	1,249,100	2,243,062
Bonneville Power Administration.....	214,400	972,000	1,186,400
Indian Office.....	17,000		17,000
National Park Service.....	3,615		3,615
Total.....	1,228,977	2,221,100	3,450,077

The working out of programs of this character at this time requires coordination with many other departments and agencies of the Government, including the Office of Production Management, the Federal Power Commission, the Reconstruction Finance Corporation and its subsidiaries, and the Rural Electrification Administration, as well as the allottees of Boulder Dam power. Responsibility for this coordination for the Department has been centralized in the Division of Power. The task of securing the Boulder power requires complicated negotiations with contractors, including agreements to waive certain provisions of present contracts for the power. In arranging for power from the Bonneville-Coulee system considerable acceleration of long-run plans as well as priorities in materials was required.

In order to provide additional power for further increases in defense production, the program for the installation of all of the generators at the Coulee Dam has been accelerated so that 1,000,000 kilowatts of power will be made available 2 to 3 years earlier than originally planned. The growth of defense loads and the increase of normal demand through the rapid development of the Northwest area fully justify this acceleration.

Defense and Permanent Development

In addition to stepping up the time schedule of the projects that can meet the immediate needs for large blocks of power for defense purposes, especially to cure deficiencies in the supply of the light metals, the Division of Power has been studying the proper location of additional projects, their construction, and the use of their power to stimulate the development of the natural resources of the West for defense and for the long-run stabilization of the economy of the region. If the rapid development of power for defense purposes is not to result after the emergency in ghost towns and idle plants, the development of the natural resources and industrial expansion of the regions where this power can be made available must be encouraged at the same time that the power construction is begun. While low-cost power will not remain unused for long periods and can be expected to attract electro-metallurgical or electro-chemical industries, the regions must have for their rounded development, industry that is based upon local resources as well as manufacturing and fabricating plants which will utilize to the full the labor potentialities of the region. Such general manufacturing, and the consequent retention of new defense business and the expansion of existing business must be encouraged to the extent possible in advance of the close of the emergency. If this is done the Government's investment in power facilities will be safeguarded.

In its supervision of the marketing plans for the power being developed under the jurisdiction of this Department, the Division of Power has been charged by the Secretary with the task of preparing recommendations in consultation with other bureaus and agencies for greater industrialization of the West and particularly for the stimulation of its mineral industries. In many cases mineral development cannot be undertaken without low-cost power, and the power is not economical without a market such as is supplied by the development of mineral industries. Among these plans is a program for the combined development of phosphates and water-power for the production of low-cost fertilizer and the consequent protection of the agriculture of the West.

In planning the Department's program for low-cost public power developments the Division of Power has considered not only whether such projects will make possible increased defense industry, but whether they will provide a means by which the standard of living of the people can be improved and the development of the whole community benefited. Since the developments under the jurisdiction of the Department have been multi-purpose projects they have in each case provided benefits in the form of water for irrigation and industrial and domestic use, flood control and navigation, as well as low-cost power for rural electrification and for domestic use. Secretary Ickes

has summarized the importance of these power facilities in pointing out that in the present industrial age, the need for electric power is similar to the need for land in the 1860's and the need for water on the land, when he said to a special committee of the Senate Committee on Public Lands and Surveys:

I do not believe in the Government doing things for people which they can do themselves, but I believe strongly in the Government taking down the hurdles and barriers so that people can do things for themselves. In Lincoln's time this meant taking down the barriers to the settlement of land. In later days it has meant making water available to farmers who could not live without it. So we passed the Reclamation Act, and its amendments. In the industrial age it means also making power available to the people and the communities, and now we are doing that.

Among the larger power developments from which the marketing of power is being planned with the assistance of the Division of Power are the Central Valley project in California, the Colorado-Big Thompson development in Colorado and the Fort Peck Dam in Montana. The approval of rate structures, marketing plans, and consequent transmission construction programs calls for a comprehensive picture of the long-run usefulness of these projects in their respective regions. None of these facilities can be isolated either from other Federal power developments in their vicinity or from the defense and long-range industrial possibilities of their areas. Studies of marketing problems of these projects are expected to be completed during the following year and well in advance of the completion of construction.

Review of Contracts

The Division of Power reviews all contracts entered into for the sale of power from projects under the jurisdiction of the Department. It advises the agencies of the Department which have immediate charge of the power projects concerning matters of policy, rate questions and related matters in connection with the disposal of power. It recommends to the Secretary the approval or disapproval of contracts.

This review makes possible the coordination of power policy between projects and the presentation of a consistent policy with respect to large utility purchasers. In this connection the Division of Power is undertaking a study of all existing contracts for the sale of power at wholesale from the various Reclamation projects. There are now in effect more than 125 such contracts with private utilities, cities, towns, irrigation districts, rural cooperatives, and other consumers. In 1940 they yielded a revenue of \$4,810,000. The review of the Division of Power of these existing contracts is intended to coordinate the

policy reflected in the contracts and to study them in the light of current conditions. As the reclamation and power program develops and as formerly isolated power projects become interconnected, uniformity of power policies in the disposition of the power becomes increasingly necessary. A great many of these contracts are expiring from time to time and the review of their provisions and operations by the Division of Power will be reflected in the terms of renewal. The contracts of the Bonneville Power Administration with municipalities, cooperatives, and other public agencies are uniform and are executed in the field without clearance by the Division of Power. Large industrial contracts and contracts for defense plants, however, have been negotiated by Bonneville officials with the help of the Division of Power. With respect to defense contracts, as with other defense matters, the Division of Power has served as a liaison for the Bonneville Administration in order to conserve time and provide continuity. All contracts for power for the Park Service are reviewed by the Division of Power except standard retail contracts.

Hetch Hetchy

As a result of the decision of the Supreme Court in the case of *United States v. City and County of San Francisco*, upholding the constitutionality of the provisions of the Raker Act of December 19, 1913 requiring municipal distribution of electric energy produced through the use of lands and rights-of-way granted San Francisco under that Act, the Secretary of the Interior was required to consider the new plans of the city for the disposition of Hetch Hetchy power. The Division of Power undertook the necessary studies to determine whether the plan submitted by the city complied with the Raker Act. The Division's analysis of the contract proposed by the city whereby the Pacific Gas & Electric Co. would have leased its distribution properties in the city to the city while in fact retaining full control of their operation was presented at an open hearing at which all parties were given an opportunity to present their views on the proposed contract. As a result of a finding of the Secretary of the Interior that the proposed plan did not comply with the terms of the act, the city prepared a new plan providing for the purchase of the company's distribution properties within the city. This new plan was submitted to the Department and analyzed by the Division of Power. It was found to be satisfactory under the terms of the Raker Act. A proposal for a charter amendment to authorize the purchase and to finance it through the issuance of revenue bonds payable solely from the profits of operation will be placed upon a ballot for the voters of the city to pass on in November elections.

Legislation

A number of bills affecting the power developments under the jurisdiction of the Department were reviewed by the Division for the report of the Secretary. These included legislation for the permanent administration of the power facilities on the Columbia River. The Division engaged in considerable research and interdepartmental conferences with the other agencies of the Government concerned with power and administrative procedures in connection with this legislation.



W. C. MENDENHALL, Director

THE ENERGIES of our Government, in these days of stress, necessarily are concentrated largely on an effort to see that the advances in science and the arts, the maintenance of freedom of individual opportunity—in short, civilization and the democratic way of life, for which this Nation has stood for 150 years—do not disappear from earth.

It is shocking to see revived, in this twentieth century, the cynical philosophy that force is to dominate the earth; that the law of the jungle is to be restored as the law of life—or death; that intellectual and spiritual freedom are again to become subordinate to brute power; that centuries of slow evolution from darkness toward light are to be extinguished in a generation.

It cannot be; but in order that it may not be, civilization itself must descend to the use of the tools of force. To survive it must use the only arguments that are comprehensible to beasts of prey, for things that man invented to lighten the burdens and improve the opportunities of life are turned now to its destruction in order that twisted and darkened minds may realize an insane ambition.

The democracies are meeting the challenge, as they must to survive, although brute force as a way of government is wholly repugnant to every principle for which they stand. Now those capacities and those energies that they have created to aid in the peaceful growth of civilization must be turned to its protection against the forces that would destroy it.

So our Government, as one of the great democracies, is turning its tremendous energies from the paths of peace into the creation of the implements of war. This is one of the greatest tragedies of all time, but it is the price of survival. Whatever its cost we must see it through.

The only possible way in which the Nation's energies can be made effective toward this end is for each individual and each group to do,

to his utmost capacity, those things that he can best do, toward the attainment of the common goal, the suppression of the enemies of civilization.

So each individual in Government, like each individual in the Nation, must contribute his strength and his training to the united effort. The Geological Survey as a unit, and the individuals in it, follow this principle. Hence, during the current year, it has directed its training and its efforts increasingly toward defense activities. The fields of strategic minerals, strategic mapping, and problems of water supply are among the fields that it is equipped to occupy. In these fields it has contributed its accumulated knowledge and the fruits of its research to the national effort. The search for minerals of which we have not enough, but that are essential to the war effort, has been fruitful; mapping for those agencies charged directly with defense has been accelerated; hundreds of reports have been rendered on water supplies vital to the establishment of war enterprises; examinations of strategic mineral deposits in our sister republics in this hemisphere have been initiated for our common defense.

Some details of this work are given in succeeding pages.

Geologic Branch

Defense Activities

Attention of the Geologic Branch during the year was focused mainly on minerals needed in national defense. An outstanding innovation was the investigation, under State Department auspices, of certain strategic-mineral deposits in several of the American republics. In these emergency projects, the branch has utilized the experience of its large staff of specialists, fortified by both fundamental and specific information accumulated during its 61 years of activity.

STRATEGIC MINERALS

The work on strategic minerals was financed largely through special appropriations totaling \$245,000, of which \$202,152 was used by the Geologic Branch in the United States and \$42,848 by the Alaskan Branch in Alaska. In addition, about \$75,000 from the regular appropriation for "geologic surveys" was devoted to work on strategic minerals. Almost the entire personnel of the Sections of Chemistry and Physics and of Petrology was engaged in work directly related to field projects on strategic minerals. Members of the Sections of Fuels, Geophysics, and Paleontology and Stratigraphy also took part in field and laboratory investigations relating to strategic minerals. Wherever feasible, Survey geologists cooperated closely with operating companies and aided materially in the search for ore bodies.

More than 150 examinations of deposits were made, some calling for only a day or two and others continuing into the fiscal year 1942. Where conditions warranted, recommendations were made to the Bureau of Mines for drilling and other exploration, and geologists were assigned to assist in these operations, study the cores and cuttings as they were obtained, and make appropriate recommendations. This close cooperation with the Bureau of Mines has produced results that the organizations working independently could not have produced.

Outstanding results of the work are illustrated by the following examples:

Preliminary estimates of tonnage and grades of chromite ore were made in 22 districts in California, Montana, Oregon, and Wyoming, and reports on them have either been published or furnished to various national defense agencies to aid the integration of domestic production with the necessary supplemental imports at a time when foreign sources of raw materials are being reduced.

Geologic work by the Survey, aiding exploration by the Bureau of Mines, has greatly facilitated development of chromite mines in the Stillwater district, Montana. One mine is now being opened in that district, a second mine has been started, and further exploration by the two bureaus may well determine the location of additional mines.

Prospecting by the Bureau of Mines for manganese in the Batesville district, Arkansas, has confirmed the presence of large ore tonnages in areas selected by Survey geologists. Similar cooperative exploratory projects in the Three Kids and Virgin River areas, Clark County, near Golconda and Valmy, Nev., have revealed extensions of the ore bodies previously known.

Among the studies of quicksilver mining districts were those of the New Idria district, California, which contains the quicksilver mine of second largest total production in the United States, and the Steens and Pueblo Mountains in southeastern Oregon. The geologic work has led to recommendations for possible exploration by the Bureau of Mines in relatively unexplored parts of the New Idria district. The area in southeastern Oregon has been very little developed, but the geologic studies show that the deposits, although of very low average tenor, are so extensive as to suggest that they may prove a source of quicksilver under emergency conditions.

In Nevada, the geologic mapping of the Bottle Creek quicksilver district pointed the way to inexpensive exploration by the Bureau of Mines which uncovered an ore body; it also indicated the presence of a large area of similar ground in which exploration is justified.

Similar results were obtained in the Yellow Pine antimony district, Idaho, where further development may lead to the direct production of antimony in addition to the amount that is being recovered in

antimonial lead as a byproduct of gold mining. This district is doubly interesting in that microscopic study of drill cores led to the recognition of the tungsten mineral scheelite. Further exploration in the light of this discovery has disclosed the presence of a large body of tungsten ore of unusually high grade in close association with the antimony ore. Microscopic study has also shown that scheelite is rather widespread in the Seven Devils district, Idaho; this study is being followed by a special search in the field for commercial concentrations of this mineral.

In Washington, geologic study of the Spokane tin area called attention to the presence of numerous scheelite-bearing quartz veins. Partial exploration by the Bureau of Mines indicates a moderate reserve of easily mined tungsten ore.

The study of tungsten districts, particularly in California and Nevada, has shown that reserves are larger than had been supposed and that the United States can at present prices supply a considerable part of its own demand for tungsten during the next few years. Other favorable areas now being examined in California may further increase domestic reserves.

Results of investigations of other strategic minerals, though less encouraging, indicate the degree to which the country can be made self-sustaining under conditions either of present metallurgical practice or of modified practice that will permit the use of lower-grade or less pure ores.

Besides investigating occurrences and supplies of the seven strategic metals—antimony, chromium, manganese, nickel, quicksilver, tin, and tungsten—the Geological Survey, in cooperation with the Bureau of Mines, has been called upon to investigate aluminum ore reserves, including those of bauxite, the only ore now used commercially, and alunite, from which a supplementary supply may be obtained. Information has also been supplied on magnesium, the utilization of which is very closely related to that of aluminum.

A reinventory of iron ores in the Pacific coast region has also been made and has served as a partial basis for the consideration of establishing an iron-and-steel industry on the west coast.

AMERICAN REPUBLICS

As a part of the program to further cooperative relations with other American republics, the Geological Survey was called upon by the Committee for Cooperation with American Republics to undertake detailed examinations of tin, tungsten, and antimony ores in Bolivia, manganese and chromium ores in Brazil and Cuba, and tin ores in Mexico. Reconnaissance examinations of certain deposits of strategic minerals in Venezuela, Colombia, Panama, Costa Rica, and Guatemala were also undertaken with a view to arranging for de-

tailed studies later. The work done thus far has given the defense agencies in the United States prompt, reliable, first-hand information on sources of raw materials that the United States needs. It is also laying the ground work for the development of long-term trade relations in minerals with the other American republics and is providing a medium for the exchange of the more cultural phases of geologic knowledge between the geologists of governmental and educational institutions in this country and the republics to the south.

Other Activities

To anyone who has read the foregoing it is obvious that "business as usual" has not been emphasized and that several projects have been suspended in order to divert trained personnel to emergency work. Certain major activities, however, have been continued, particularly the cooperative studies in Colorado, Idaho, Kansas, Massachusetts, Oregon, and Virginia. The regular cooperative programs in mining regions of Colorado, Idaho, and Oregon were closely coordinated with the general strategic minerals program and added materially to the basic information essential to the further development of mineral deposits. The work in Kansas and Virginia threw additional light on the occurrence of oil and gas and pointed the way for further exploration.

Although a large proportion of the staff of the Fuels Section had been transferred to the investigation of strategic minerals, study of mineral fuels was continued in the Santa Maria Basin, California, the Powder River coal field, Montana, the Yampa coal field, Colorado, the Jackson area, Mississippi, and the Olympic Peninsula, Washington. The study of source rocks of petroleum, in cooperation with the American Petroleum Institute, was completed and the report delivered to the American Association of Petroleum Geologists for publication.

Among the general studies of classic areas, field work was completed and reports were submitted on the Coast Ranges north of San Francisco Bay and on the Death Valley region of California; also in the Zion Canyon and the Paunsaugunt regions of Utah and in west Texas. Work was continued on the phosphate deposits of Idaho and Wyoming, the Tertiary basins and the Saypo and adjoining quadrangles in Montana, the Cretaceous-Tertiary boundary in the Rocky Mountain States, and the Appalachian and Piedmont regions of New Jersey, Pennsylvania, Maryland, and Virginia. General paleontologic and strategic studies were continued insofar as time permitted.

The compilation of the consolidated volume of the bibliography of North American geology for 1929-39 has been continued, and preparation of the biennial volume for 1940-41 is well advanced.

The Section of Chemistry and Physics, in addition to its intensive work on strategic minerals, continued its investigations of phosphate and potash samples and its identification of specimens for correspondents. Waste brine from a sodium sulphate plant was shown to contain recoverable amounts of potassium and magnesium. Improved methods for the chemical analysis of chrome ore were developed and applied to the study of samples from several Western States as well as from Cuba and South America. Even more noteworthy was the application of X-ray methods to the identification of the crystal structure of chromite and related minerals, which were too opaque and poorly crystallized to be identified by any other means. X-ray methods have also proved very useful in the identification of manganese minerals and have pointed the way to further chemical and physical investigations which are being pursued as rapidly as possible. Spectrographic, optical, and other physical tests have been regularly made when needed to supplement chemical analyses.

Research on the montmorillonite group of clay minerals—the clays most critically important in soil problems—was undertaken in cooperation with the Department of Agriculture. Work was continued on the dehydration of clay and other minerals, the absorptive powers and activation of clays, the porosity and permeability of oil and gas sands, and the measurement of temperatures in deep wells. A report on the distribution of nickel in the earth's crust was transmitted for publication, and study of the distribution of uranium and thorium was continued.

The Section of Geophysics, besides continuing work on the design and construction of geophysical instruments and the preparation of geophysical abstracts, developed a method for locating buried channels in the gold-placer region of California. In cooperation with the city of Rochester, N. Y., it located the preglacial channel of the Genesee River as a source of ground water. Magnetometric and gravimetric methods were used in the search for chromite deposits in Pennsylvania, and electrical resistivity was used in exploration of the potash deposits of New Mexico.

Services rendered by the Survey to other Federal agencies included expert advice to the Office of Production Management and the Metals Reserve Co. concerning the reserves of strategic minerals deposits and the possibilities of their development under various economic conditions; also special examinations and reports for the Office of Indian Affairs, National Park Service, Bureau of Mines, and Division of Investigations, Department of the Interior, and the Bureau of Internal Revenue, Treasury Department. Survey geologists are serving on the Advisory Committee on Metals and Minerals of the National Academy of Sciences, which acts in an advisory capacity to the Office of Production Management.

Work of the year, by States

Alabama.—Studies were begun on bauxite deposits in Colbert, Barbour, and Henry Counties. Work was continued on the geology of the Epes quadrangle, on the red iron ores in northeastern Alabama, on the brown iron ores of the Russellville district; and on the paleontology and stratigraphy of the lower Claiborne and the Oligocene formations. A deposit of tin in Coosa County was examined. A short paper on deposits of Selma and Ripley age was transmitted for inclusion in a State publication.

Arizona.—The strategic and critical minerals program consisted of continued investigations of manganese in the Artillery Peak and Aguila districts and examinations at Willow Beach, Peach Springs, and Tombstone in the Sheeptanks district, and in the vicinity of Safford and Topcock; and of tungsten at the Tungsten Reef mines in the Huachuca Mountains, the Morristown district, the Boriana mine, and on the King and Little Fanney properties in the Little Dragoon Mountains. Study of the geology and mineral resources of the Pearce and Benson quadrangles was continued.

Arkansas.—Detailed work was continued in the Batesville manganese district, and brief examinations were made of manganese deposits at Glennwood and in west-central Arkansas. The quicksilver area of Pike County was investigated. A preliminary study of bauxite reserves near Little Rock was made, and studies of the stratigraphy of the Morrow group and of fossils of the Hindsville limestone were continued.

California.—Strategic minerals investigations consisted of studies of chromite in the Black Diamond, San Luis Obispo, Little Castle Creek, Copper Mountain, Doe Flat, Seiad Creek, McGuffy Creek, French Ridge, and Canyon del Puerto areas; manganese in the Tesla, Buckeye, Paymaster, Chemehuevis, and Braito areas and in Mendocino, Humboldt, and Trinity Counties; quicksilver in the New Idria, Coso, Stayton, Parkfield, and New Almaden areas, the High Grade and Cedarville districts, and a region that includes the Oceanic, Adelaida, Pine Mountain, and San Carpojaró districts; tin in the Cajalco (Temescal) and Cima districts; tungsten in the Tungsten Hills, the High Sierras, the Benton Range, the Atolia district, the Greenhorn Mountains, and near Posey; and antimony at Antimony Ridge. Chapters in Bulletin 922 have been issued covering the chromite deposits in the Pilliken area and the Seiad quadrangle; quicksilver deposits in the Mayacmas and Sulphur Bank districts, in San Luis Obispo County and southwestern Monterey County, and in the Mount Diablo district; tungsten in the Atolia district, the Tungsten Hills, and the Benton Range; and antimony in the Wildrose Canyon. Bulletin 931-B covers the Cedarville and High Grade quicksilver deposits.

Other investigations covered the geology of the Sequoia National Park, in cooperation with the National Park Service, resulting in a report entitled "Outline of geology of Sequoia National Park" and three albums of photographs illustrating geologic features of the park, with explanatory texts; resistivity and magnetic surveys of an old buried auriferous channel in the Newtown Flat area and of the Grey Eagle chromite mine area; and geology and structure of the Death Valley region and the San Andreas Rift. Brief field examinations of iron deposits in San Bernardino, Inyo, San Luis Obispo, and Riverside Counties were made. A preliminary report on structural features of the Virgin Spring area, Death Valley, was prepared for publication by the Geological Society of America. Reports on the geology and oil resources of the Santa Maria district, Santa Barbara County; the geology of the Reef Ridge, Coalinga district; the Eocene stratigraphy and paleontology of the Coalinga anticline; and the Foraminifera from the type area of the Kreyenhagen shale were in preparation.

Colorado.—Continued cooperation with the Geological Survey Board of the State of Colorado and the Colorado Metal Mining Fund in metal mining studies included geologic mapping of the Ouray, Red Mountain, Sneffels, Telluride, Chattanooga, and Ophir districts in the San Juan region; the gold placers and Quaternary geology of the Leadville and Tarryall-Breckenridge areas; the vanadium and uranium deposits of the Paradox Valley; and the geology and ore deposits of the Minturn quadrangle. Progress was made on reports on the Nederland tungsten district, the Jamestown, Leadville, Cripple Creek, La Plata, and Gold Hill districts, and the west slope of the Mosquito Range. Papers on new light on the geology of the Cripple Creek district, and its practical significance, and structural control of ore deposition in the Red Mountain, Sneffels, and Telluride districts were submitted for publication by the State. Other studies in Colorado covered the geology and coal resources of the Yampa coal field and stratigraphy in La Plata River Valley, southwest of Durango. Strategic minerals studies consisted of a brief inspection of quicksilver prospects near Breckenridge and along upper Blue River; vanadium prospects at Placerville, Uravan, Telluride, and Eagle; and nickel at the Copper King nickel mine at Gold Hill.

Connecticut.—Brief examinations of mica deposits at Middletown were made as a part of the strategic minerals program.

Florida.—Further studies were made for a revision of the geologic map of the State and on the paleontology and stratigraphy of the Alum Bluff group.

Georgia.—A report on the geology of the coastal plain was transmitted for publication. Study of the geology of the Cartersville region was continued. Brief preliminary examinations of bauxite deposits and mines in Sumter, Macon, Floyd, and Wilkins Counties and of chromite deposits near Louise, Troup County, were made.

Idaho.—Investigations were made for manganese in the Little Eightmile district; antimony in the Yellow Pine district; tungsten in the Blue Wing, the Seven Devils, and the Yellow Pine districts; and quicksilver in the Weiser district. A preliminary report on the antimony of the Yellow Pine district has been published as Bulletin 922-I. Bulletin 931-A covers the Blue Wing tungsten deposits. A press release announced the discovery of tungsten in the Seven Devils district. In cooperation with the Idaho Bureau of Mines and Geology, studies were continued on the geology and ore deposits of the Seven Devils district and begun in the Texas mining district, and reports on the Clark Fork and the Rocky Bar gold districts were in progress. Other projects included the geology and mineral resources of the Afton, Paradise Valley, Ammon, and Irwin quadrangles and the Teton Basin phosphate area.

Kansas.—In cooperation with the Geological Survey of Kansas, study of the subsurface features of the Forest City Basin, including special study of the McLouth oil pool, was continued. The cooperative report on subsurface Mississippian rocks was published as State Geological Survey Bulletin 33. A new map of Kansas showing the oil and gas fields and geologic ages of producing formations was issued.

Maine.—Study of manganese occurrences was begun in the vicinity of Presque Isle.

Maryland.—Geologic and geophysical surveys were conducted in the chromite areas of the State Line district, Maryland and Pennsylvania.

Massachusetts.—Geologic work in continued cooperation with the Massachusetts Department of Public Works comprised detailed geologic mapping in Manomet, Plymouth, Wareham, Plympton, Northfield, Bernardston, Tyngsboro, Billerica, Lowell, Norwood, Westford, Millers Falls, Mount Grace, Greenfield, Mount Toby, Ayer, Brockton, and Concord quadrangles. Special studies in-

cluded geologic features of the Connecticut Valley; preliminary survey of pegmatites; geology of the coast line of northeastern Massachusetts, the Boston Harbor area from Marblehead to Nantasket, and the Braintree fossil locality, and gravel and sand deposits of the Ludlow, Granby, Amherst, and adjacent areas. Reports were issued by the Massachusetts Department of Public Works on the geology of the coast line between Point Gammon and Monomoy Point, the Blue Hills and Northfield quadrangles, Cape Cod, the Quabbin Reservoir area, and the coast of northeastern Massachusetts, also on pegmatites in Massachusetts, gravel and sand deposits of Ludlow, Granby, Amherst, and adjacent areas, and on seismic methods of determining deposits of bedrock as applied in the Lowell quadrangle, with an introductory chapter on the geology of the quadrangle.

Mississippi.—A report on the stratigraphy of Upper Cretaceous deposits, prepared in cooperation with the Mississippi Geological Survey, was issued as Bulletin 40 of that survey. Work was continued on the Jackson area and on paleontology and stratigraphy of the Oligocene formations and the Vicksburg group. Preliminary studies were made of bauxite deposits in Tippah and Pontotoc Counties.

Missouri.—Brief examinations of manganese deposits were made at Eminence, Salem, and Ellington. Paleontologic and stratigraphic studies were continued on the Mississippian faunas in the Wyandotte quadrangle and on fossils of the Hindsville limestone.

Montana.—Strategic minerals investigations included chromite deposits in the Stillwater complex and at Benbow and Mount View Lake; nickel deposits of the Mouat nickel mine; antimony in the Thompson Falls district; and manganese at Butte and in the Philipsburg district. Reports on the Philipsburg district and the Stillwater complex have been published as chapters G and N, respectively, of Bulletin 922. Other investigations included mapping of gold deposits in parts of the Judith Mountains; continued studies of physiography and glacial geology of western Montana; faulting of intermontane basins in western Montana; general geology, stratigraphy, and structure of the Saypo quadrangle; coal resources of the Powder River area; geology and physiography of the Little Rocky Mountains and Fort Belknap Indian Reservation; fossil plants of the Fort Union and associated formations; and a brief examination of iron deposits near Stanford. A geologic map and notes on useful minerals of the Fort Berthold Indian Reservation were prepared for the Office of Indian Affairs.

Nevada.—The strategic minerals program included studies of manganese in the Three Kids, Virgin River, Black Rock, Black Eagle, Black Diablo, and Shoshone districts; nickel at Key West; tungsten in Golconda, Potosi, Rose Creek, Mill City, Nightingale, Ragged Top, and St. Anthony districts, and the Minerva and other districts in the Snake Range; tin in the Izenhoo and Majuba Hill districts; quicksilver in the Ivanhoe, Bottle Creek, National, Paradise, Wild Horse, Antelope Springs, Mount Tobin, and Lone Pine districts and the Opalite-Bretz district of Oregon and Nevada. The Bottle Creek and the Buckskin Peak quicksilver districts are covered by chapters of Bulletin 922, the Long Pine district is included in Bulletin 931-B, and the Goldbanks quicksilver district of Pershing County is covered by volume 34 of the University of Nevada Bulletin. Continued studies included the general geology and ore deposits of the Eureka district and of the Hawthorne, Tonopah, Ivanpah, and Sonoma Range quadrangles; a resurvey of the Comstock lode; and magnetic surveys in the Comstock area.

New Hampshire.—Examinations were made of mica mines and prospects at Keene and Bristol and of the mica-bearing pegmatites, in connection with the strategic minerals program.

New Jersey.—Bulletin 920 on the geology and mineral resources of the Delaware Water Gap and Easton quadrangles, New Jersey and Pennsylvania, was issued.

New Mexico.—The Rincon and Hot Springs districts and the Little Florida Mountains were studied for manganese, and a preliminary report on the Little Florida area was issued as Bulletin 922-C. Results of the investigation for tin in the Black Range district were published as Bulletin 922-M. Other investigations included sodium sulphate deposits; potash deposits near Carlsbad; Carboniferous fossil plants, Virgil and Wolfcamp fusulinids, and stratigraphic studies of the Permian-Pennsylvanian contact. A report on the geology and ore deposits of the Magdalena district was transmitted for printing.

New York.—Geophysical surveys were made in the Genesee Valley near Rochester in the search for additional water supply in cooperation with the City of Rochester. Graphite deposits in western Saint Lawrence County were studied.

North Carolina.—Detailed geologic mapping was carried on in the Micaville and Spruce Pine quadrangles, with special reference to mica deposits and the mica-bearing pegmatites. A report is in preparation on the Carolina tin belt, and a paper on the genetic history of the pegmatites and associated rocks of the Carolina tin belt was presented before the American Association for the Advancement of Science. Nickel occurrences at Webster, a chromite deposit at Democrat, and manganese deposits at Sparta were examined. Detailed geologic mapping of a part of the Raleigh quadrangle was begun.

North Dakota.—Geophysical examinations were made in cooperation with the Division of Ground Water to locate areas favorable to the occurrence of ground water for the city of Fargo. A manganese deposit near Dunseith was examined.

Oklahoma.—A study of subsurface geology and oil and gas resources of Osage County was completed. Chapters D, E, and F of Bulletin 900 have been published; chapters G, H, and I are in press, and chapters J and K are ready for transmittal. Papers on initial daily production of wells in the Burbank and South Burbank oil fields, on the relationship of crude oils and stratigraphy in parts of Oklahoma and Kansas, and on structural interpretations of gravity observations in southeastern Oklahoma were published by the American Association of Petroleum Geologists. A press memorandum entitled "New Oil Pools May Be Discovered in Osage Indian Reservation" was issued. In cooperation with the Office of Indian Affairs and the Bureau of Mines, an appraisal was made of damages to the Osage interests which would result from construction of the proposed Hulah Dam on the Caney River. Other continued projects include study of Mississippian stratigraphy and paleontology of the Wyandotte quadrangle, fossils of the Hindsville limestone, and stratigraphy of the Morrow group. A brief examination of a manganese deposit at Bromide was made.

Oregon.—The strategic minerals program included examination of quicksilver deposits in the Steens and Pueblo Mountains area, in the Opalite-Bretz and Glass Buttes districts, and at the Currier mine; chromite deposits in the John Day region, the Kerby, Grants Pass, and Medford quadrangles, Coos County beach sands, and the Chollard district. Examination was made of nickel deposits on Nickel Mountain, near Riddle, and of manganese deposits near Unity and Baker. Bulletins 922-D and 922-P covering chromite in Grant County and the Sourdough and Briggs Creek areas were issued. Reports on the Currier mine and Glass Buttes quicksilver deposits are included in Bulletin 931-B. Iron ore deposits near Medford, Portland, and Eugene, and in localities in Columbia and Washington Counties were studied. In cooperation with the Oregon Department of Geology and Mineral Industries, geologic mapping in the Medford, Grants Pass, and Kerby quadrangles and magnetometer surveys in the Willamette Valley in the Coos Bay region were continued. A preliminary geologic map of the Grants Pass quadrangle was completed for release by the State.

Pennsylvania.—Geologic and geophysical surveys were made of the chromite deposits of the State Line district, Maryland, and Pennsylvania. Studies were

continued on regional metamorphism in the lower Kittanning coal beds and on a detailed section of coal-bearing rocks across Bituminous Coal Basin, and a paper on further evidence of the Reading overthrust was presented before the American Association for the Advancement of Science.

South Dakota.—A report on the tin-bearing pegmatites of the Tinton district, Lawrence County, surveyed in 1940, is in press. A brief inspection was made of a manganese deposit near Custer.

Tennessee.—A cooperative study of the stratigraphy and structure of the east Tennessee zinc district was continued. Brief examinations of manganese deposits were made in the vicinity of Elizabethton, of iron deposits of the Euchee and Trenton areas to be flooded by the waters of the Watts Bar Dam, and of bauxite deposits on Missionary Ridge at Hixson.

Texas.—The west Texas Permian, the Sierra Diablo area, the southern Guadalupe Mountains, and new fusulinids from the Cisco group in the Brazos River region were investigated; also the Pennsylvanian and Permian of parts of Texas and New Mexico, stratigraphic relations of Woodbine and Eagle Ford formations in northeastern Texas, the lower Claiborne of east Texas, and stratigraphy of the central mineral region.

Utah.—The strategic minerals investigations included manganese deposits in the Drum Mountains, Green River, Castle Dale, and Kanabe districts and a brief examination near Manila; and antimony in the Antimony district and in Coyote Canyon near Antimony. Other projects covered the Strawberry Valley-Wasatch Mountains; alunite of the Marysvale region; geology and physiography of the plateau region of the southwest with special attention to a report on the Cedar Breaks National Monument; inspection of ore deposits of the Wah Wah Range; and studies of vanadium near La Sal, Kane Springs, Richardson, Dewey, and Cisco.

Vermont.—Work on a detailed geologic map of the Barre quadrangle and small parts of the adjacent area was continued. A paper on lower Ordovician stratigraphy of central Vermont was submitted for outside publication. Asbestos prospects in northern Vermont in the vicinities of Lowell, Eden, and Troy were examined, and a reconnaissance was made of some serpentine bodies between Lowell and Troy.

Virginia.—The strategic minerals investigations included manganese in the Rustburg, Elkton, Mount Jackson, and Vesuvius quadrangles and in the Cedar Creek district. A report on the Irish Creek tin deposits is in preparation. Investigations in cooperation with the State included the structure, stratigraphy, and gas resources of the Early Grove area, the continuation of the study of the Great Gossan lead in southwestern Virginia, and a study of the titanium deposits of the State.

Washington.—The strategic minerals program included studies of manganese deposits in the Lake Crescent, Dosewallips, and Lake Cushman districts; nickel deposits at Mount Vernon; tungsten deposits at Silver Hill, Germania, and Deer Lake; tin deposits at Silver Hill; and chromite in the Twin Sisters district. Investigation of the oil and gas possibilities of the west slope of the Olympic Mountains was in progress, and a brief study was made of the iron ore deposits in several areas.

West Virginia.—Examinations of manganese deposits were made in the Bluefield area.

Wyoming.—Strategic minerals investigations in Wyoming consisted of studies of manganese deposits on Sundance Creek in the Bear Lodge Mountains and in the Medicine Bow area. Other studies included the continued mapping of the geology and mineral resources of the Afton and Irwin quadrangles; the phosphate resources of the Teton Basin, partly in Idaho; fossil plants of the Fort Union and associated formations; geology and mineral resources of the west side and northeastern flank

of the Big Horn Basin; a magnetometer survey of the chromite bodies at Casper Mountain, and geology and limnology of the Green River formation.

In cooperation with the National Park Service, a study was made of fossil flora in the Yellowstone National Park, and two short papers on that subject were prepared for the National Park Service. A field examination was begun of the coal and oil resources and the surface and subsurface strata and structure of the Maverick Springs oil field.

Alaskan Branch

The work of the Geological Survey in Alaska from its inception has been premised on the idea that proper utilization and administration of that great northern empire should go hand in hand with adequate knowledge of what are its resources and what are the conditions under which they occur. Necessarily, answers to these questions must be drawn from all fields of human endeavor. However, with regard to the general geographic features and the mineral resources of the Territory, the special staff of Alaska geologists and engineers in the Geological Survey has been fitted by long training and experience to carry out the necessary field and office studies required to answer authoritatively questions relating to those special



SEEK HIDDEN DEFENSE STORES

In search of strategic mineral deposits, a Geological Survey expedition crosses one of the high passes in the Alaska Range. Carrying all needed supplies for the season, the Survey geologists and engineers with their pack trains traverse thousands of miles of such country in carrying out scientific work under the national conservation program.

subjects and by their reports and maps to make that information readily available. Thus, the maps of the physical features of the country that are made by the Alaskan Branch of the Geological Survey are either used directly or form the base from which practically all other Government maps of the land area of Alaska are prepared; so that answers as to where is a place, how far is it from some other feature, what is its elevation, what is its situation with regard to routes, rivers, highlands, and similar geographic features can be answered most definitely and readily by consulting the available Survey Alaska maps. So too, its geologic maps and its reports on the mineral resources of the surveyed areas are eagerly consulted and utilized by the prospector in his search for new deposits, the mining operator in planning for the development of his property, the investor, seeking to utilize his funds wisely, administrators of the national domain and those responsible for the defense of the Nation, for wise legislation, or for the proper utilization of the property they hold in trust for the benefit of all our citizens.

How important the mineral resources of Alaska are in the economics of both the Territory and the Nation is shown by the fact that to the close of 1940 Alaska mines had furnished minerals to the value of more than \$830,000,000 and the value of their output during 1940 was \$28,470,000. In recent years the annual mineral production has come from mines of gold, platinum metals, coal, limestone, silver, lead, antimony, tin, quicksilver, and copper. In the past marble, gypsum, barite, tungsten, and chromium have also been produced in significant amounts, and deposits containing nickel, molybdenum, sulfur, arsenic, bismuth, asbestos, and graphite at times have been exploited.

As is readily apparent, in a country a fifth the size of the United States proper complete information on all these subjects cannot be acquired in a short time or with a small outlay of funds. Therefore, relatively rapid and inexpensive surveys are made to explore first large tracts of country and to determine their larger geographic features and principal mineral resources, such surveys to be followed up by more thorough examinations of the parts that are thus found to have greatest promise of development in the near future. Such a selective treatment is obviously the most economical and effective method of procedure because in the exploratory surveys a party covers several thousand square miles a season at a cost of a few dollars a square mile, whereas on detailed work the same party covers only a hundred square miles at a cost perhaps of upwards of a hundred dollars a square mile.

The three classes of surveys adopted by the Alaskan Branch are exploratory surveys on a scale of 8 miles or more to the inch, reconnaissance surveys on a scale of 4 miles to the inch, and detailed sur-

veys on a scale of 1 mile or less to the inch. The following table shows the area surveyed topographically and geologically to December 31, 1940.

	Exploratory surveys	Reconnaissance surveys	Detailed surveys	Total
Topographic surveys.....	84, 891	187, 789	4, 625	277, 305
Geologic surveys.....	107, 131	148, 910	4, 154	260, 195

Owing to the strong seasonal control exercised by the weather and other conditions in Alaska the projects undertaken by the Geological Survey in the Territory do not readily lend themselves to description by fiscal or calendar years. Consequently, money for the Survey's regular Alaska investigations is made available immediately on the passage of the annual appropriation act. A project started in May 1940 and ended in May 1941 is considered as falling in the season of 1940, though up to June 30, 1940, it may have been paid from funds for the fiscal year 1940 and after July 1 from funds for the fiscal year 1941. In addition to funds for its regular work, the Branch received supplementary allotments from the Survey's general item for investigation of strategic minerals and special transfers of funds from the War Department for two detailed mapping projects during the season of 1940 and for a map compilation project in the season of 1941.

Field work.—Of the 12 field projects carried on during the field season of 1940, 5 involved geologic investigations related to the mineral resources, 5 were topographic work, and 2 were for general purposes. Three of the geologic projects related directly to the investigation of deposits of the strategic minerals tin, nickel, and chromite and 2 were broader areal studies. The studies of strategic minerals were especially stressed in connection with the Nation's emergency defense program. The tin investigations consisted of detailed examination of the Lost River area, in western Seward Peninsula, where occurrences of tin minerals in both lodes and placers have long been known but lately have not been mined. The nickel deposits on Yakobi Island, off the northwest coast of Chichagof Island about 80 miles west of Juneau, in southeastern Alaska, were examined closely. The chromite deposits near Seldovia, near the southwestern tip of Kenai Peninsula, were examined in detail. At one time considerable ore was shipped from them, though lately they have not been mined. The areal studies included (1) reconnaissance mapping of the geologic formations and mineral resources of the country adjacent to the Nabesna and Chisana Rivers, tributaries of the Tanana River near the international boundary and (2) the closer identification of the age of certain formations in the Yukon and Copper River Valleys and in southeastern Alaska. The topographic projects included two reconnaissance surveys by ground methods—one of an extensive tract in the valley of Holitna River, a tributary of Kuskokwim River, and the other of scattered tracts in the Copper River Valley and near Juneau, in southeastern Alaska. Aerial photographs were obtained of a considerable part of the lowland area extending from Nenana, in the Tanana Valley, to and beyond Lake Minchumina, which lies close to parts of the Kuskok-

wim drainage system, and smaller tracts in other parts of the Yukon region. Detailed topographic maps of prospective airfields in southeastern Alaska and central southern Alaska were made at the request of the Army and paid for from its funds. One of the general-purpose projects was undertaken to collect data regarding recent mining trends and developments to aid in administering the work in hand, as well as affording first-hand information from which to formulate plans for the future conduct of the work. The other general project aimed at obtaining information required in the conduct of certain phases of the current work of the Branch and to assist in making the Survey maps and reports more available and useful to the public.

Of the 13 projects authorized for the field season of 1941, 6 were strategic minerals investigations, 3 were general areal geologic and mineral resources reconnaissances, 3 were topographic mapping, and 1 was for general purposes.

The demand for larger and larger supplies of the strategic minerals has become more insistent as the drive for expediting the defense program of the Nation has gained momentum. As a consequence, efforts to determine what contributions Alaskan deposits can make to supply these demands has been given greater consideration by the Geological Survey. The six strategic minerals investigations cover some of the minerals investigated in the season of 1940 but at entirely different localities.

For tin the Geological Survey has in the field one party examining in great detail part of the York area, in western Seward Peninsula, about 15 miles west of the Lost River area that was surveyed in 1940, and another party making similar investigations in the Hot Springs district, in the Yukon-Tanana region. Time permitting, a small party from the Hot Springs group will make topographic surveys of certain other prospective tin areas lying some 30 to 60 miles north and west of the Hot Springs area so that maps will be available for geologic studies another season. Other nickel deposits on the west coast of Chichagof Island near Mirror Harbor will be studied in great detail by another Survey party.

In the search for chrome ore a party will spend part of the season examining a reported occurrence at Red Bluff Bay, on the eastern coast of Baranof Island in southeastern Alaska, and its leader will revisit the chrome deposits near Seldovia. The latter work will be in cooperation with the engineers of the Bureau of Mines who will visit the properties to determine the practicability of carrying on drilling tests to determine the quality and persistence of the ore in depth.

Other deposits of strategic minerals that will be investigated each by a separate Survey party are quicksilver deposits near Sleitmut, in the Kuskokwim Valley, tungsten in the Hyder and Chichagof districts, southeastern Alaska, and antimony in the Kantishna district, on the northern slopes of the Alaska Range, and in nearby parts of the Bonnifield and Fairbanks districts.

General areal geologic surveys are in progress in the Delta River district, which embraces part of the Alaska Range and certain valleys of the streams, some of which flowing north are tributary to Tanana River and others flowing south join the Copper River; in the Porcupine River region between Yukon River and the international boundary; and at several scattered localities in southeastern Alaska. Two of the topographic projects that were initiated by the Geological Survey and contribute directly to its mineral resources work include a ground survey in the Yentna-Cache Creek district, on the southern slopes of the Alaska Range, whose streams form part of the Susitna system; and aerial surveys that form a continuation of the project started in the season of 1940 to obtain cartographic material from which maps could be constructed of the lowland areas of the Tanana and Kuskokwim Rivers between Nenana and McGrath. This year's work on the latter project is designed to carry other work westward from Lake Minchumina to and beyond McGrath. The third topographic project is one primarily needed

by the War Department and paid for by a transfer of funds from that Department. This project calls for the compilation of topographic data on a small scale from aerial photographs that will be taken by the War Department and made available to the Geological Survey. The only general-purpose project that has been authorized for the 1941 season is similar to the one described above undertaken to afford general information as to current developments and for looking after the work of the Branch.

Office work.—The foregoing field projects involved much office and laboratory work to prepare the results for publication. This included identification of the specimens collected, completing the field maps and drawings, converting the data obtained from the aerial views to cartographic form, interpreting the various observations, and writing the reports. The annual canvass of the production of minerals from the Territory was made, including the analysis and tabulation of returns from mine operators throughout the Territory and checking these results with information obtained from other sources in order to show the amount of each kind of mineral produced, the district from which it came, and new developments. These statistical reports are made on the basis of the calendar year so that for part of the time the canvasses for 2 years or of 2 seasons run concurrently.

Reports and maps.—During the year four reports containing maps, seven new maps, five of which are for official use only, reprints of six maps, and five press statements have been published. Ten reports containing maps, four new maps, and a reprint of two maps are in course of publication. In addition, six reports and one map and extensive aerial compilation work are in progress. Three reports prepared by personnel of the Alaskan Branch were approved for outside publication.

Topographic Branch

The headquarters office of the Topographic Branch and of the Atlantic Division is located at Washington; the headquarters office of the Pacific Division is at Sacramento, Calif.; and that of the Central Division at Rolla, Mo. Section offices were maintained at Denver, Colo., and Chattanooga, Tenn. The branch also has a drafting office at Clarendon, Va.

General Office Work

Necessary office work incidental to the field work of the Topographic Branch consisted of the computation and adjustment of the results of control surveys, photoplanimetric compilation, and the inking, inspection, and editing of the completed topographic field sheets prior to their submission for reproduction.

Section of Computing.—Preparing the results of leveling, transit traverse, and triangulation for use in the control of topographic mapping and for other purposes is the routine function of the section. Review of field computations, tabulation of results in form for distribution, readjusting older surveys to the standard datums, assembling and coordinating control information for the use of topographers and other field engineers were continued as routine duties.

For national-defense activities, many specific requests from the War Department for very large amounts of control-survey information have been filled. Microfilmed copies of the results of all leveling, traverse, and triangulation done by the Geological Survey have been furnished to the War Department. This work, which was done in cooperation with the Work Projects Administration, involved preparation and rearrangement of material and making of about 67,500 camera exposures to photograph it.

Manuscripts containing the results of spirit leveling in parts of Illinois and Texas were prepared and transmitted for publication. The following bulletins were published during the year: 883-B, Spirit leveling in Texas, the second of seven parts; 913, Triangulation in Utah; 916-D, 916-E, 916-F, 916-G, and 916-H, Transit traverse in Missouri, the last five of eight parts; and 919, Spirit leveling in Michigan.

Section of Photomapping.—Planimetric maps of 24 complete or partial 7½-minute quadrangles in Louisiana and 19 complete or partial 15-minute quadrangles in Wisconsin, covering a total area of 3,256 square miles, were compiled from aerial photographs by the radial-line method. By the same method a line map or planimetric base of one 7½-minute quadrangle in Alabama was completed, covering 64 square miles.

By the use of the aerocartograph, line-map or planimetric bases were completed from aerial photographs of 10 7½-minute quadrangles or parts of quadrangles in Massachusetts, 11 10-minute quadrangles or parts of quadrangles in Maine, 2 15-minute quadrangles or parts of quadrangles in Alabama, 5 15-minute quadrangles or parts of quadrangles in Mississippi, 4 7½-minute quadrangles or parts of quadrangles in New York, part of 1 15-minute quadrangle in Virginia, part of 1 15-minute quadrangle in Indiana, and the revision of the map of Washington and vicinity, District of Columbia, Maryland and Virginia, covering a total area of 4,627 square miles.

Commercial firms photographed for the Geological Survey 12,172 square miles, and photographs covering 2,238 square miles were purchased from commercial firms. Negatives covering 215 square miles from which contact prints were made were hired from commercial firms. Photographs covering 6,033 square miles were purchased from other Government agencies. Negatives covering 15,678 square miles, from which contact prints were made, were borrowed from other Government agencies. Photographs procured for use by the Geological Survey covered areas totaling 36,336 square miles, more than half of which was for national defense mapping projects. Of this area 3,642 square miles was compiled.

Section of Cartography.—Work on the United States part of the map of the world on the scale of 1:1,000,000 was continued. Sheet

N J-18, Chesapeake Bay, was lettered, edited, and transmitted for publication. The compilation and inking of Sheet N K-16, Chicago, was completed and lettering was in progress. Sheet N K-17, Lake Erie, was in course of compilation.

For the Public Roads Administration the preparation of the Transportation Map of the United States was continued. Compilation and inking were in progress on 56 sheets. Proofreading and checking were done on 60 sheets. Maps of 2 States, comprising 21 sheets, were published, and maps for 3 States, comprising 36 sheets, were in course of publication.

Section of Inspection and Editing.—During the year 6 new topographic maps were prepared for photolithographs as two-color advance sheets and 32 as planimetric maps; 135 new topographic maps were edited for publication, of which 106 were for multicolor lithographs and 30 for engraving; and 147 quadrangle maps, 8 State maps, and 7 State index maps were prepared and edited for reprint editions. Editing was completed on 169 maps published as illustrations, making a total of 466 maps edited. Corrections to 277 quadrangle maps were edited for correcting the copper plates before furnishing velox prints to the War Department. Four hundred and fifty-six proofs of maps of all kinds were read.

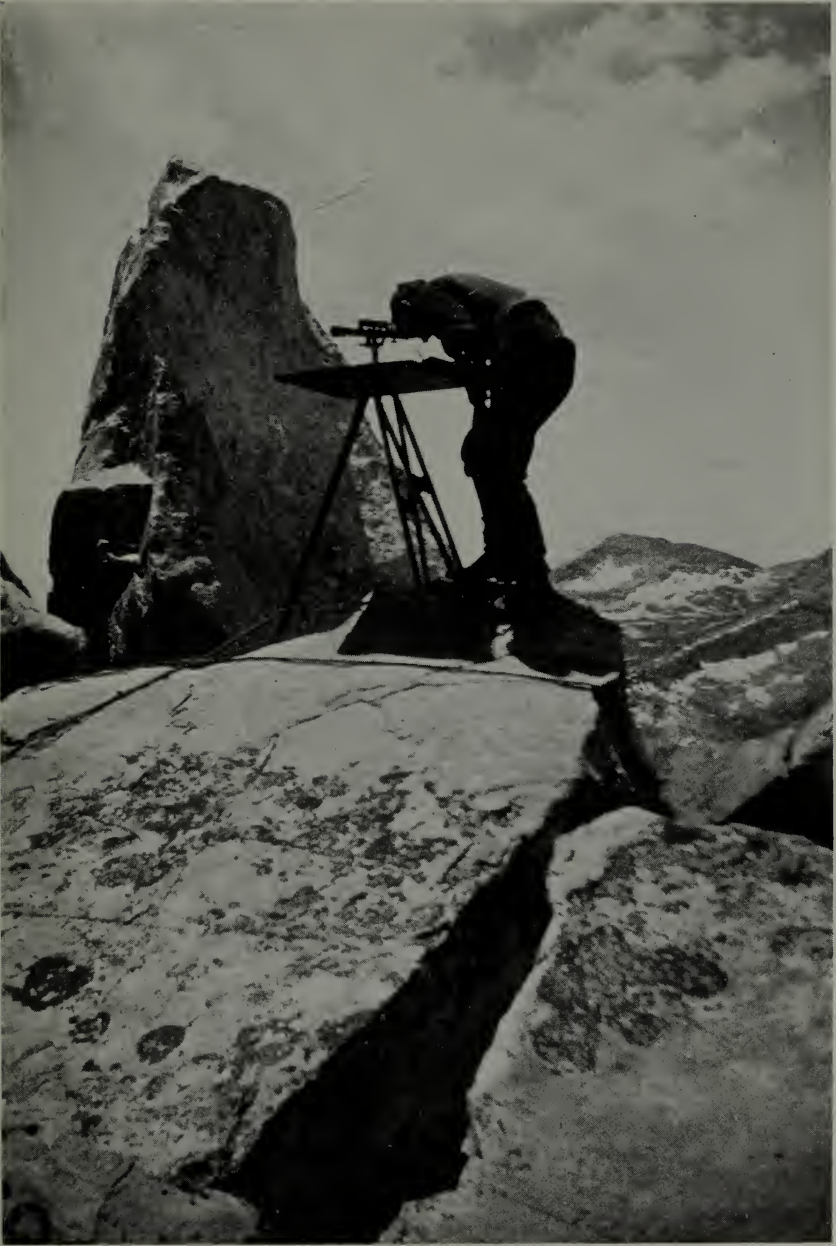
On June 30, maps in the process of reproduction included 130 topographic maps being engraved, 1 two-color photolithograph, 99 multicolor photolithographs, and 27 planimetric maps. Of topographic maps to be engraved, 16 were in the process of editing and 67 were awaiting editing. Of maps to be reproduced by multicolor lithography, 29 were in the process of editing and 86 were awaiting editing.

For the Conservation Branch the work of preparing river surveys for publication was continued. Work was done on 13 different projects. The maps of 6 projects, comprising 25 separate sheets, were transmitted during the year for reproduction by photolithography.

For the Tennessee Valley Authority five maps were prepared and transmitted for reproduction, and proofs of eight maps were read.

Map Information Office

The Map Information Office serves as a clearing house for geographic, topographic, and aerial photographic data pertaining to Federal as well as commercial mapping agencies. It maintains extensive card index files and houses a collection of sample maps of practically every type published by Government bureaus, foreign countries, and commercial mapping organizations. It is staffed and equipped to furnish expeditiously survey, map, and geographic information to Federal offices, to State institutions, and to an interested



THIS, TOO, IS OUR AMERICA

Mapping far-distant areas under United States sovereignty, identifying out-of-the-way corners of the Nation linked to national defense, is part of the conservation work of the Geological Survey carried on by engineer-scientists who, equipped with transit and plane-table, scale such perilous mountain peaks as this.

public. The custodian of the Map Information Office acts also as secretary to the Federal Board of Surveys and Maps. The work of the Map Information Office, as well as the clerical work of the board, is done entirely by Geological Survey personnel.

Field Surveys

Work was done in 38 States, in the District of Columbia, and in Puerto Rico. Cooperative projects were conducted in 17 of these States, in Puerto Rico, and with the Tennessee Valley Authority.

For the Tennessee Valley Authority, mapping within the Tennessee River Basin was continued by the use of aerial photographs and the stereophotogrammetric method. On June 30, 38 Geological Survey employees were engaged on this project.

Of the total area of the United States, 46.3 percent has been covered by topographic maps prepared by the Geological Survey.

Work of the Year, by States

Alabama.—Rock Run and vicinity (Ala.-Ga.) completed. For the War Department, the 15-minute quadrangles Bay Minette, Creola, Delchamps, Foley, Fort Barrancas (Ala.-Fla.), Grand Bay (Ala.-Miss.), Hurley (Ala.-Miss.), Muscogee (Fla.-Ala.), Pelican Island, Petit Bois Island (Ala.-Miss.), Robertsdale (Ala.-Fla.), and Weeks Bay and the 7½-minute quadrangle Stapleton completed and the 15-minute quadrangle Wilmer (Ala.-Miss.) begun.

Arizona.—The 15-minute quadrangles Palo Alto and Sunset completed. For the War Department, the 15-minute quadrangles Cochise, Dos Cabezas, Sasabe, Tucson Mountains Southwest, Tucson Mountains Southeast, and Vamori completed and the 15-minute quadrangles Aquirres Creek, Arivaca, Dragoon Southwest, Johnson, Sells, and Ventani begun.

Arkansas.—The 15-minute quadrangle Antoine completed. In cooperation with the Arkansas Geological Survey, the 7½-minute quadrangles Cabot Northeast and Cabot Southeast completed and the 7½-minute quadrangle Cabot Northwest begun.

California.—The 7½-minute quadrangle San Diego Southeast completed. In cooperation with the State engineer of California, the 15-minute quadrangle Cape Fortunas completed and the 15-minute quadrangle Rohnerville begun. For the War Department, the 15-minute quadrangles Newcastle, Orangevale, Ortigalita Peak, Pleasant Valley, Ragged Valley, and San Ardo completed and the 15-minute quadrangles Bangor, Fruto, Hernandez, Jenny Lind, Lodoga, Panoche Valley, Richardson Springs, Rogers, and Sutter Creek begun. For the Navy Department, the Fall Brook project begun.

Colorado.—The 15-minute quadrangles Castle Rock, Elbert, and Garfield, the Tenmile mining district, and the Chattanooga mining area completed and the Dinosaur National Monument begun.

Florida.—For the War Department, the 15-minute quadrangles Century, Fort Barrancas (Fla.-Ala.), Milton, Muscogee (Fla.-Ala.), and Pensacola completed.

Georgia. The 15-minute quadrangle Adairsville, the Cartersville mining district, and Rock Run and vicinity (Ala.-Ga.) completed. In cooperation with the Tennessee Valley Authority, the 7½-minute quadrangles Culberson (Ga.-N. C.), Epworth (Ga.-Tenn.), Gumlog (Ga.-N. C.), Hiwassee (Ga.-N. C.),

Ivylog (Ga.-N. C.), Mineral Bluff (Ga.-N. C.-Tenn.), and Osborn (Ga.-N. C.) completed and the 7½-minute quadrangle Hightower Bald (Ga.-N. C.), the Nottely dam site, and the Ocoee tunnel site begun.

Idaho.—The 15-minute quadrangle Blackfoot completed.

Illinois.—In cooperation with the Illinois Department of Registration and Education, Geological Survey Division, the 15-minute quadrangles Carmi, Galva, and Rose Hill completed, the 15-minute quadrangles Forrester, Maquon, Mount Carroll, and St. Elmo continued, and the 15-minute quadrangle Newton begun.

Indiana.—In cooperation with the Indiana Department of Conservation, Division of Geology, the 7½-minute quadrangles Lafayette, Lawrenceburg Northeast, Lawrenceburg Southwest, Lawrenceburg Southeast, Merom Northeast, Rising Sun Northeast, Rising Sun Northwest, Rising Sun Southwest, Rising Sun Southeast, Sullivan Southeast, and Turkey Lake Southwest completed and the 7½-minute quadrangles Lawrenceburg Northwest, Merom Southeast, Oaktown Northwest, and Sullivan Southwest begun. For the Navy Department, the Burns City project begun.

Iowa.—The 15-minute quadrangle Seymour continued.

Kansas.—The 15-minute quadrangle Terryton completed. In cooperation with the Kansas Geological Survey, the 7½-minute quadrangles Wichita Northeast, Wichita Southwest, and Wichita Southeast completed and the 7½-minute quadrangle Douglas Northwest begun.

Louisiana.—In cooperation with the Louisiana Department of Public Works, planimetric maps completed for the 7½-minute quadrangles Albany, Amite, Bolivar, Clifton, Folsom, Franklinton, Greensburg, Holden, Husser, Kentwood, Liverpool, Loranger, Montpelier, Onville, Pools Bluff, Robert, Rio, Roseland, Spring Creek, Sunny Hill, Talisheek, Thigpen, Thomas, Tickfaw, Waldheim, Walkiah Bluff, Wilmer, and Zona and begun for the 7½-minute quadrangles Baywood Northeast, Baywood Northwest, Baywood Southwest, Baywood Southeast, Chipola Northeast, Chipola Northwest, Chipola Southwest, Chipola Southeast, Jackson Northwest, Jackson Northeast, Jackson Southwest, Jackson Southeast, Leander Northeast, Leander Northwest, Leander Southwest, Leander Southeast, Leesville Northeast, Leesville Northwest, Leesville Southwest, Leesville Southeast, Kisatchie Northeast, Kisatchie Northwest, Kisatchie Southwest, Kisatchie Southeast, Slagle Northeast, Slagle Northwest, Slagle Southwest, and Slagle Southeast, and contoured maps begun for the 7½-minute quadrangles Bayou Valentine and Lewiston.

Maine.—In cooperation with the Maine Public Utilities Commission, the 15-minute quadrangles Oquossoc and Sebec completed. For the War Department, the 15-minute quadrangles Bar Harbor, Castine, Dyer, Forest, Island Falls, Mattawamkeag, Mount Desert, Oxbow, Patten, Sebouis, and Waite completed and the 15-minute quadrangles Bath, Biddeford, Berwick (Maine-N. H.), Big Lake, Bluehill, Boothbay, Freeport, Gardners Lake, Haynesville, Kennebunk, Norridgewock, Seragly Lake, Tug Mountain, Vinalhaven, Wabassus Lake, Wesley, and Wytopitlock begun.

Massachusetts.—In cooperation with the Massachusetts Department of Public Works, the 7½-minute quadrangles Ashfield, Clinton, Concord, Framingham, Maynard, Natick, Orleans, and Wellfleet completed and the 7½-minute quadrangles Hudson and Westboro begun.

Michigan.—The 7½-minute quadrangle Ypsilanti East completed. In cooperation with the Michigan Highway Department, the 7½-minute quadrangles Belleville, Carleton, Denton, Erie, Flatrock, Maybee, Monroe, Rockwood, Stony Point, Wayne County Airport, and Wyandotte completed and the 7½-minute quadrangles Clarkston, Highland, Northville, Pontiac North, Pontiac South, and Wayne begun.

Mississippi.—For the War Department, the 15-minute quadrangles Grand Bay (Ala.-Miss.), Horn Island, Hurley (Ala.-Miss.), Lucedale, Pascagoula, Petit Bois Island (Ala.-Miss.), and Vancleave completed and the 15-minute quadrangle Wilmer (Ala.-Miss.) begun.

Missouri.—The 15-minute quadrangle Coin (Iowa-Mo.) completed. In cooperation with the Missouri Geological Survey and Water Resources, the 15-minute quadrangles Bedford (Iowa-Mo.), Big Piney, Drynob, Gentry, Marshall, Maryville, New Market (Iowa-Mo.), Parnell, Quincy (Ill.-Mo.), and the 7½-minute quadrangles Iconium, Lowry City, and Weaubleau and the Jefferson City Airport completed; the 15-minute quadrangles Boss, Manes, Mountain, Plum Valley, Richland, Salem, and Stone Hill continued, and the 15-minute quadrangles Lebanon, Troy, and Ritchey and the 7½-minute quadrangle Valhalla begun. For the War Department, the Seventh Corps Training Area completed.

Montana.—The 15-minute quadrangle Mount Cowen completed, the 15-minute quadrangle Mount Wallace continued, and the 15-minute quadrangles Lewistown Northeast, Lewistown Southwest, and Lewistown Southeast begun.

Nevada.—The 15-minute quadrangle Antler Peak completed.

New Hampshire.—The 15-minute quadrangle North Conway completed.

New Mexico.—The 15-minute quadrangle Nacimiento Peak completed. For the War Department, the 15-minute quadrangles Aden, Afton, Desert, Jarilla Mountains No. 2, Las Cruces, Las Curnas Southwest, La Mesa, Myndus Northeast, Newman, Organ Peak, and Orogrande completed and the 15-minute quadrangle Las Curnas Northeast begun.

New York.—In cooperation with the New York Department of Public Works, the 7½-minute quadrangles Brewerton, Cicero, and Manlius completed.

North Carolina.—The 15-minute quadrangle Durham South and the 7½-minute quadrangles Addie, Cruso, Dunsmore Mountain, Hazelwood, Horseshoe, Pisgah Forest, Sam Knob, Shining Rock, and Waynesville completed and the 15-minute quadrangle Barco begun. In cooperation with the Tennessee Valley Authority, the 7½-minute quadrangles Canton, Enka, Fruitland, Oteen, Sandymush, and Skyland completed and the 7½-minute quadrangles Asheville, Black Mountain, Craggy Pinnacle, Hendersonville, Montreat, and Weaverville begun.

Oklahoma.—The 7½-minute quadrangles Britton Southwest and Oklahoma City Northwest begun.

Oregon.—The 15-minute quadrangles Izee Northeast, Izee Northwest, and Canyon City Northwest completed.

Pennsylvania.—In cooperation with the Pennsylvania Department of Internal Affairs, Topographic and Geologic Survey, the 15-minute quadrangle Brockwayville completed and the 15-minute quadrangles Caledonia and Ridgway begun.

South Dakota.—The 15-minute quadrangle Iona completed.

Tennessee.—The 7½-minute quadrangles Birchwood, Big Spring, Charleston, Decatur, Evensville, Goodfield, Graveston, Graysville, Knoxville North, Norris, and Powell Station completed. In cooperation with the Tennessee Valley Authority, the 7½-minute quadrangles Athens, Ausmus, Big Ridge Park, Blockhouse, Calderwood (Tenn.-N. C.), Calhoun, Camp Forest, Capitol Hill, Carters Creek, Clouds, Cumberland Springs, Demory, Dutch Valley, Etowah, Godwin, Harriman, Howard Quarter, Kinzel Springs, Madisonville, Manchester, Maynardville, McDonald, Niota, Ooltewah, Ovoca, Powder Springs, Riceville, Snow Hill, Swan Island, Sweetwater, Tallassee, Tranquility, Vonore, Well Spring, and White Hollow and the Nashville Airport completed and the 7½-minute quadrangles Daisy, East Cleveland, South Cleveland, and Tazewell and the Appalachia tunnel site begun.

Texas.—The 15-minute quadrangle Standart completed. For the War Department, the 15-minute quadrangles Finlay Mountains, Fort Hancock, Fort Quitman,

Hueco Mountains, McNary, San Antonio Mountain, and Tepee Butte completed.
Utah.—The 15-minute quadrangle Monroe completed.

Vermont.—In cooperation with the Vermont Department of Conservation and Development, the 15-minute quadrangle Plainfield completed.

Virginia.—The 15-minute quadrangles Back Bay (Va.-N. C.) and Orkney Springs (W. Va.-Va.) and the 7½-minute quadrangle Annandale completed and the 7½-minute quadrangle Falls Church begun. In cooperation with the Virginia Conservation Commission, Geological Survey, the 15-minute quadrangles Clarks-ville (Va.-N. C.) and Weyers Cave and the 7½-minute quadrangle Hopewell completed and the 15-minute quadrangles Mount Jackson and Pounding Mill and the 7½-minute quadrangle Chester begun.

Washington.—In cooperation with the Washington Department of Conservation and Development, the 15-minute quadrangle Reardan Southeast completed. For the War Department, the 15-minute quadrangles Anacortes, Burlington, Deception Pass, and Stanwood completed and the 15-minute quadrangles Clear Lake, East Sound, Marysville, and Richardson begun.

Wisconsin.—In cooperation with the Wisconsin Highway Commission, plani-metric maps completed for the 15-minute quadrangles Athelstane, Marinette (Mich.-Wis.), Monico, Porterfield, Rhinelander, Stephenson (Mich.-Wis.), Wausaukee (Wis.-Mich.); continued for Brantwood and Pike Lake 7½-minute quadrangles; and begun for the 7½-minute quadrangles Agenda, Carter, Elcho, Ironwood (Wis.-Mich.), Manitowish, Parrish, Pearson, Thunder River, and Timme.

Wyoming.—The Superior mining district completed.

Water Resources Branch

The Water Resources Branch collects and publishes data on the quantity, chemical quality, and availability of surface and ground waters. This information is prerequisite to the orderly and wise development of domestic, municipal, and industrial water supplies; for irrigation and navigation projects; for flood protection, recreational uses, air conditioning, wildlife conservation, water-power development, and the control of pollution in streams.

Work that was started last fiscal year in connection with water problems pertinent to the national defense program was expanded to meet the growing demand. Data on the availability and quality of water were required by defense activities for purposes of determining proper locations for industrial plants manufacturing defense materials, military camps, housing units, and airports. This work presented many additional hydrologic problems and cost approximately \$35,000.

The appropriation for gaging streams in 1941 provided \$1,244,500, of which \$1,000,000 was available only for cooperation with States and municipalities. Water data are collected and compiled in cooperation with Federal bureaus, States and municipalities, and with permittees and licensees of the Federal Power Commission. The aggregate expenditures during the year approximated \$3,000,000.

Federal bureaus.—The following Federal bureaus made available nearly \$737,000 to cover the cost of investigations conducted for them

by the Branch: The Mississippi River Commission and the Office of the Chief of Engineers, War Department; Bureau of Yards and Docks, Navy Department; Department of Justice; the Tennessee Valley Authority; the Flood Control Coordinating Committee, Department of Agriculture; the Weather Bureau, Department of Commerce; the Bureau of Reclamation, the Division of Territories and Island Possessions, the Fish and Wildlife Service, the National Park Service, the Office of Indian Affairs, and the Office of Land Utilization, Department of the Interior; the Department of State; the Federal Power Commission; and the National Resources Planning Board.

States.—The total amount contributed by States and municipalities for cooperative water-resources investigations was about \$970,000. Additional data and records were furnished by private organizations and individuals at an estimated cost of \$290,000.

Permittees and licensees of the Federal Power Commission.—At the request of the Federal Power Commission, 29 engineers of the Branch have been designated as representatives of the Commission to perform such field work as may be assigned them by the Commission. About 317 gaging stations were operated by the Branch or by permittees and licensees under the supervision of the Branch in connection with 129 projects of the Commission. Engineers of the Branch have had field supervision of operation under permits and licenses of the Federal Power Commission in connection with 163 projects.

Division of Surface Water.—The Division of Surface Water, functioning through 45 field offices, made field investigations and office studies of surface-water resources relevant to the social and economic development of the Nation, especially to national defense. The primary function involved collecting, analyzing, and preparing for publication the records of stages and discharges of streams in 47 States and the Territory of Hawaii. Cooperative surface-water investigations were made with 63 State agencies and 67 counties and municipalities.

The large program of work involving the construction, operation, and maintenance of gaging stations in connection with the flood-control investigations and maintenance and improvement of river and harbor works of the Corps of Engineers, War Department, was continued. Many other Federal agencies continued cooperative stream-flow investigations with the Division.

At the end of the year 4,848 gaging stations were in operation, of which 3,708 were equipped with water-stage recorders. This includes 793 stations on canals, ditches, lakes, reservoirs, and rivers where stages only are measured, the records being of particular value in connection with problems of water utilization, storage, and flood protection. During the year 66,609 regular and 4,123 miscellaneous discharge measurements were made. Manuscripts for 15 water-supply

papers containing records of the flow of streams and other data were transmitted for Survey publication. Fifty-eight technical papers relating to surface-water resources were prepared for publication in outside periodicals or for presentation at scientific meetings.

The division made special field and reconnaissance studies, prepared special reports, and furnished data from water-supply papers or other records to the primary defense agencies of the Federal Government, to industries engaged in the manufacture of defense materials, and to cities having water-supply problems resulting from industrial expansion. Information on surface-water resources was supplied in response to more than 500 requests from defense agencies, consulting engineers, manufacturers, and others. Typical of the service rendered was that given to the Mahoning Valley Water Defense Committee. Special field investigations were made, and reservoir records and records of the flow of the Mahoning River and its tributaries were supplied to that committee for its use in studying means for conserving or augmenting the flow of the river for the cooling water required by the steel mills in the Mahoning Valley.

Division of Ground Water.—The Division of Ground Water investigates the waters that lie below the surface in the zone of saturation, from which wells and springs are supplied; the source, occurrence, quantity, and head of these waters; their conservation; their availability and adequacy for domestic, industrial, irrigation, and public supplies, and as watering places for livestock and desert travelers; and the methods of constructing wells and recovering water from them, and of improving springs. The constantly increasing use of water supplies from wells is causing a greater demand each year for intensive studies of the quantities of ground water that are perennially available.

During the year work was done in 41 States, Hawaii, Puerto Rico, and the District of Columbia. About 100 technical reports or papers were released to the public, and 28 technical papers were presented before scientific societies or other organizations. Periodic measurements of water levels or artesian pressure were made in about 6,400 observation wells, about 300 of which were equipped with recording gages. Tests on water-bearing materials were made in the hydrologic laboratory. A feature of the year was a conference on salt-water encroachment, at which 30 papers were presented.

Reports were furnished on ground-water conditions and available water supplies in more than 300 localities that were being considered for Army or Navy establishments or for defense industries. About 150 of these were for the Office of Production Management, about 85 for the War Department, and about 25 for the Navy Department. Reports in regard to ground-water supplies for defense projects were also made to the Civil Aeronautics Authority, the National Advisory Commission for Aeronautics, the Coast Guard, the United States

Housing Authority, the Reconstruction Finance Corporation, the Federal Communications Commission, and the National Resources Planning Board; and information was furnished to consulting engineers and contractors working on defense projects. This covered areas in about three-fourths of the States, Hawaii, Alaska, Puerto Rico, and the British West Indies. Field investigations were made in about 65 of the areas. For the other areas information was obtained from previously published reports of the Survey and other sources. Thus the work during past years in systematically collecting data and making comprehensive investigations of the ground-water resources of the country has enabled the Survey to render prompt and effective service, resulting in a saving of time and money, and has greatly strengthened the basis of the entire defense program with respect to water supply.

Division of Quality of Water.—The Division of Quality of Water analyzes water from surface and underground sources with reference to its suitability for industrial, agricultural, and domestic use (not related to questions of health) so far as such use is affected by the dissolved mineral matter. During the year analyses were made in Washington of 1,960 samples of water from surface and underground sources. These included many analyses made for cooperative studies of ground water in the different States and for special investigations of water supplies for specific projects, including national defense. During the year 12,636 samples were examined by this Division or under its technical supervision in five field laboratories.

Studies of suspended and dissolved matter in the Colorado River and its tributaries were continued, and current tables of analyses of Lake Mead water were released. The intensive study of the chemical character of the waters of the Pecos River in New Mexico was continued. Tables were released showing records of precipitation, discharge, and suspended matter at four stations on demonstration projects of the Soil Conservation Service; also a report on studies of silt movement in the streams in the Boise River Basin, Idaho.

Close cooperation with the Division of Ground Water was continued in the study of problems relating to the quality of ground water and in the preparation of those sections of ground-water reports involving consideration of the chemical character of the waters. Miscellaneous water analyses were made or information and advice on problems of quality of water were furnished seven Federal departments, six independent Federal agencies, and numerous private organizations and individuals.

Division of Water Utilization.—The Division of Water Utilization conducts a wide variety of hydrologic studies and compiles data in relation to the utilization and control of the waters of streams. It

coordinated data on outstanding floods and prepared the data for publication. This information is useful in the location of military activities and defense industries to avoid interruption by floods. Miscellaneous studies were made of water resources and projects involving compilation of data on topographic characteristics that may relate to determination of flood flows, which studies were in part sponsored by the Public Works Administration and the Work Projects Administration.

Investigations of the water problems along the international boundary between the United States and Canada have been continued for the State Department and the International Joint Commission. Special studies were made of the Columbia River to determine what effect the building of Grand Coulee Dam would have on water levels at the international boundary. The request by a Canadian corporation for permission to store more water in Kootenai Lake to provide additional power for the Canadian war effort necessitated the study of backwater along Kootenai River in Idaho.

The Division has acted as consultant in special hydrologic problems connected with the soil and moisture conservation program of the Department under the direction of the Office of Land Utilization. In the furtherance of this important work a hydrologic library and reference files covering this special subject have been established.

Realizing that the water supply of the various parts of the country has a direct relation to the defense program, a monthly press release on current stream-flow conditions as indicated by selected gaging stations has been initiated. These releases give a current picture of the Nation's surface-water supply and have been of particular value in relation to the defense program during the drought conditions existing at the end of the year. Weekly reports were prepared during the critical periods.

Numerous papers and discussions concerning technical aspects of hydrology were contributed to technical and scientific journals and seven reports were completed.

Division of Power Resources.—The Division of Power Resources collects and compiles information in regard to developed and potential water power of the United States. In cooperation with the Division of Commercial Affairs, State Department, a compilation was made of the water-power plants constructed in 1940 in different countries. Information on the plants in the United States, Alaska, and Hawaii was obtained through the Public Works Administration, the Tennessee Valley Authority, the War Department, the Department of Agriculture, and the field engineers of the Division of Surface Water. Information for Canada was obtained from the Minister of Mines and Resources.

Work of the Year, by States

Alabama.—The State geologist and Federal agencies cooperated in operating 60 gaging stations and in investigating ground-water resources, chiefly in the Cretaceous rocks and in the vicinity of Mobile.

Arizona.—The State water commissioner and Federal agencies cooperated in surface and ground-water investigations in the drainage basins of the Upper Gila, Santa Cruz, and Big Sandy Rivers, and together with the Salt River Valley Water Users' Association and Maricopa County Municipal Water Conservation District, cooperated in operating 76 gaging stations. Analyses of water, measurements of silt load in the Colorado River, and partial analyses of water in Lake Mead were made.

Arkansas.—The State Highway Commission, the State geologist, and Federal agencies cooperated in operating 47 gaging stations. The State Agricultural Experiment Station cooperated in ground-water investigations in the Grand Prairie region.

California.—The State Department of Public Works, Orange, Riverside, San Bernardino, Santa Barbara, and Ventura Counties, the Los Angeles County Flood Control District, the cities of Lodi, San Diego, Santa Barbara, and Santa Cruz, the Metropolitan Water District of Southern California, the Santa Clara Valley Water Conservation District, the East Bay Municipal Utility District, Stanford University, and Federal agencies cooperated in operating 336 gaging stations. Ground-water investigations were made in the coastal area of Orange and Los Angeles Counties in cooperation with Orange County Flood Control District, Orange County Water District, Los Angeles Flood Control District, and the city of Long Beach, and in Santa Barbara County in cooperation with that county.

Colorado.—The State engineer and Federal agencies cooperated in operating 200 gaging stations. Reconnaissances were made on the ground waters in the South Platte, Arkansas, and Republican Valleys. Samples from the Colorado and Gurnison Rivers were analyzed.

Connecticut.—The State Water Commission and the cities of Hartford and New Britain cooperated in operating 36 gaging stations; the Commission also cooperated in ground-water studies in the New Haven area.

District of Columbia.—In cooperation with Federal agencies two gaging stations were operated. A survey of ground-water pumpage and the periodic measurement of water levels in observation wells were continued.

Florida.—Investigations of surface water, ground water, and quality of water were made in cooperation with Dade County and the cities of Miami, Miami Beach, and Coral Gables. These agencies, together with the State Road Department, the cities of Jacksonville, St. Augustine, and Tampa, and Federal agencies, also cooperated in operating 81 gaging stations. The State Geological Survey and the city of Pensacola cooperated in ground-water investigations in other parts of the State.

Georgia.—The State Department of Natural Resources cooperated in investigating surface water, ground water, and quality of water, chiefly in the coastal area, and with the aid of other Federal agencies, in operating 79 gaging stations.

Hawaii.—The Territory of Hawaii cooperated in surface-water and ground-water studies and in the operation of 125 gaging stations.

Idaho.—The State Department of Reclamation and Federal agencies cooperated in the operation of 230 gaging stations. Studies were made of the silt movement in streams of the Boise River Basin.

Illinois.—The State Department of Public Works and Buildings, the State Department of Registration and Education, the East Side Levee and Sanitary District, and Federal agencies cooperated in the operation of 107 gaging stations.

Indiana.—The State Department of Public Works, the cities of Fort Wayne and Indianapolis, and Federal agencies cooperated in the operation of 48 gaging stations. The State Division of Geology cooperated in a State-wide observation-well program and in investigating the ground water of the Indianapolis area.

Iowa.—The State Geological Survey cooperated in ground-water investigations in the Mason City, Cedar Rapids, and other areas, and with the State Conservation Commission, the State Institute of Hydraulic Research, and Federal agencies, cooperated in the operation of 81 gaging stations.

Kansas.—The State Board of Agriculture and Federal agencies cooperated in the operation of 61 gaging stations. The State Geological Survey, the State Board of Health, and the cities of Wichita and Lawrence cooperated in extensive investigations of ground water and quality of water.

Kentucky.—The State Highway Department and Federal agencies cooperated in the operation of 77 gaging stations.

Louisiana.—The State Department of Conservation, the State University, and Federal agencies cooperated in the operation of 40 gaging stations; and the Department of Conservation, Caddo and Bossier Parishes, and the city of Natchitoches cooperated in ground-water investigations in 10 parishes.

Maine.—The State Public Utilities Commission and Federal agencies cooperated in the operation of 41 gaging stations.

Maryland.—The State Geological Survey, the Washington Suburban Sanitary District, and the cities of Baltimore and Salisbury, together with Federal agencies, cooperated in the operation of 30 gaging stations. Analyses were made of water samples from the Patuxent Research Refuge at Bowie. A ground-water reconnaissance was made in the Baltimore area.

Massachusetts.—The State Department of Public Works cooperated in ground-water investigations, and with the Metropolitan District Water Supply Commission, the Metropolitan District Commission, the State Department of Public Health, and Federal agencies, cooperated in the operation of 48 gaging stations.

Michigan.—The State Stream Control Commission and Federal agencies cooperated in operating 50 gaging stations. The State Department of Conservation cooperated in the observation-well program.

Minnesota.—The State Division of Drainage and Waters and Federal agencies cooperated in operating 401 gaging stations.

Mississippi.—The State Geological Survey cooperated in ground-water investigations conducted in the alluvial plain and coastal area, and with Federal agencies it cooperated in operating 56 gaging stations.

Missouri.—The State Geological Survey and Water Resources, the State Highway Department, and Federal agencies cooperated in the operation of 93 gaging stations.

Montana.—The State engineer, the State Water Conservation Board, the city of Bozeman, and Federal agencies cooperated in operating 159 gaging stations.

Nebraska.—The State engineer and Federal agencies cooperated in operating 71 gaging stations. The State Conservation and Survey Division cooperated in ground-water investigations in Richardson County and the eastern part of the Republican River Valley.

Nevada.—The State engineer and Federal agencies cooperated in operating 14 gaging stations. A ground-water reconnaissance was made in the Las Vegas and Muddy River areas.

New Hampshire.—The State Water Resources Board and Federal agencies cooperated in operating 39 gaging stations.

New Jersey.—The State Water Policy Commission cooperated in ground-water investigations, and with the North Jersey District Water Supply Commis-

sion, the Delaware River Joint Toll Bridge Commission, and Federal agencies, cooperated in operating 86 gaging stations.

New Mexico.—The State engineer, Interstate Stream Commission, and Federal agencies cooperated in investigations of surface water, ground water, and quality of water and in the operation of 174 gaging stations.

New York.—The State Departments of Conservation and of Public Works, the State Water Power and Control Commission, Oswegatchie River Improvement Commission, the Black River and the Hudson River Regulating Districts, Nassau County, New York City Board of Water Supply, and the New York City Department of Water Supply, Gas, and Electricity, Buffalo Sewer Authority, the cities of Albany, Auburn, and Jamestown, and Federal agencies cooperated in operating 165 gaging stations. Ground-water investigations were made in cooperation with the State Water Power and Control Commission, Nassau and Suffolk Counties, and the city of Rochester.

North Carolina.—In cooperation with the State Department of Conservation and Development and Federal agencies, 132 gaging stations were operated. Ground-water investigations were made in cooperation with Elizabeth City and Wilmington.

North Dakota.—The State engineer and Federal agencies cooperated in operating 37 gaging stations. The State geological survey and city of Fargo cooperated in ground-water investigations in the Fargo, Oakes, and other areas.

Ohio.—The State Division of Conservation and Natural Resources, the State University Experiment Station, the Miami Conservancy District, the city of Columbus, and Federal agencies cooperated in operating 133 gaging stations. Butler and Hamilton Counties cooperated in ground-water investigations in the Cincinnati area.

Oklahoma.—The State Planning and Resources Board, Grand River Dam Authority, Oklahoma City, and Federal agencies cooperated in operating 63 gaging stations. The State Geological Survey cooperated in ground-water investigations, chiefly in Beaver and Cimarron Counties.

Oregon.—The State engineer, Umatilla County Court, the cities of McMinnville and Portland, and Federal agencies cooperated in operating 239 gaging stations. The State Agricultural Experiment Station and the State engineer cooperated in ground-water investigations, chiefly in Lake and Tillamook Counties.

Pennsylvania.—The State Department of Forests and Waters, the city of Harrisburg, and Federal agencies cooperated in operating 142 gaging stations. The State Department of Internal Affairs cooperated in the observation-well program.

Rhode Island.—The State Department of Public Works and Federal agencies cooperated in operating nine gaging stations.

South Carolina.—The State Highway Department, the city of Spartanburg, the town of Duncan, and Federal agencies cooperated in operating 41 gaging stations. Observations on wells were made in the Tiger River area.

South Dakota.—The observation-well program was continued in cooperation with the State Geological Survey. Federal agencies cooperated in operating 18 gaging stations.

Tennessee.—The State Department of Conservation, the State Department of Health, and Federal agencies cooperated in the operation of 109 gaging stations. The city of Memphis cooperated in ground-water investigations in the Memphis area.

Texas.—The State Board of Water Engineers and the Red Bluff Water Power Control District cooperated in investigations of surface water, ground water, and quality of water, and these agencies, with the Upper Guadalupe Authority and Federal agencies, cooperated in operating 174 gaging stations. The cities of Houston, Galveston, and El Paso also cooperated in ground-water investigations.

Utah.—The State engineer cooperated in ground-water investigations, chiefly in the Cedar City, Escalante, Parowan, and Tooele Valleys; and with Federal agencies he cooperated in operating 71 gaging stations. Water analyses were made of samples from the San Juan, Colorado, and Green Rivers.

Vermont.—The State of Vermont and Federal agencies cooperated in the operation of 38 gaging stations.

Virgin Islands.—Water samples from St. Croix were analyzed and a report on the ground waters of the island was completed.

Virginia.—The State Conservation Commission and Federal agencies cooperated in operating 93 gaging stations, and, through the State Geological Survey, cooperated in ground-water investigations, chiefly in the southern part of the coastal plain.

Washington.—The State Department of Conservation and Development, the Intercounty River Improvement Commission, Columbia, Skagit, Walla Walla, and Whatcom Counties, the cities of Aberdeen, Bellingham, Everett, and Tacoma, and Federal agencies cooperated in operating 126 gaging stations. The State Department of Conservation and the cities of Bremerton and Tacoma cooperated in ground-water investigations.

West Virginia.—The State geologist, the State Public Service Commission, and Federal agencies cooperated in operating 78 gaging stations.

Wisconsin.—The State Public Service Commission, the State Statutory Committee on Water Pollution, and Federal agencies cooperated in operating 95 gaging stations.

Wyoming.—The State engineer, the State Planning and Water Conservation Board, and Federal agencies cooperated in operating 137 gaging stations, and the State Board and city of Cheyenne cooperated in ground-water investigations in Laramie County.

Conservation Branch

The work of the Conservation Branch involves surveys and investigations for an inventory of the water and mineral resources of the public domain, supervision of private operations for development of power and production of minerals from public and Indian lands and naval petroleum reserves, and supplying information and advice to numerous Government agencies engaged in administration of various laws affecting the public domain.

Sources of energy—coal, oil, gas, and water power—are among the most important resources of the public domain and play an essential role in activities for national defense. Normal needs of the Nation, as well as the emergency requirements of defense, demand that our resources be conserved by orderly development and judicious use. The work of the Branch accordingly has been directed to encouraging efficient operation of the mineral development on the public lands under its supervision, to maintaining standards of conservation that will lead to the adoption of better development and production practices in the mineral industries throughout the Nation, and to locating favorable sites for the utilization of the vast power resources of streams and rivers of our Western States, particularly where other sources of energy are not available.

Mineral production during the year from public and Indian lands and naval petroleum reserves under supervision had an estimated value of \$71,000,000, and the revenue accrued therefrom amounted to about \$7,000,000. Compared with this substantial revenue, the cost of supervision, \$455,000, is small.

Mineral Classification Division

The office activities of the Mineral Classification Division were directed mainly to making geologic determinations that are required in public-land administration and that are prerequisite to the grant of lease and prospecting rights under the mineral-leasing laws and to the approval of assignments of such rights of agreements for the unitization of oil and gas holdings, of participating areas pursuant to such agreements, and of applications to acquire Federal land under the nonmineral land laws. Incidental progress was made, however, in defining the known geologic structure of producing oil and gas fields involving Federal land and in classifying and restoring lands that were withdrawn for coal more than 30 years ago. Applications for rights-of-way across Federal lands for communication and power lines, oil and gas pipe lines, highways, irrigation works, and other purposes, requiring scrutiny for possibilities of conflict with current or future mineral development, were the most numerous of recent years.

For aid in mineral classification, information was obtained in the field by division personnel on the occurrence of coal in parts of Colorado and Wyoming; of oil and gas in California, Colorado, Montana, New Mexico, Oklahoma, and Wyoming; and of potash in New Mexico.

In the routine work of the Division, 7,171 cases requiring technical consideration were disposed of during the fiscal year; 1,667,631 acres were restored from coal withdrawals, 1,442,358 acres were classified or reclassified as coal land, and 250,080 acres were classified or reclassified as noncoal, all in Montana. In addition, definitions of the known geologic structure of six producing oil and gas fields were prepared and promulgated and prior definitions of two such fields were revised.

On June 30, 1941, outstanding definitions of the known geologic structure of producing oil and gas fields in California, Colorado, Kansas, Montana, New Mexico, North Dakota, Oklahoma, Utah and Wyoming aggregated 1,561,601 acres.

Water and Power Division

The work of obtaining basic information on the water-power resources and storage possibilities on public lands and of making it available for use in the administration of public-land laws and to

Federal and other agencies engaged in planning, constructing, and operating water-power projects was continued. River-utilization surveys covering 85 miles of streams and tributaries, detailed surveys of three dam sites, and a topographic survey of Nisqually Glacier, in Washington, were made. Preparation of summary reports of investigations on rivers in public-land States was begun and 10 such reports were issued in mimeograph form.

Office activities resulted in the addition of 27,508 acres to outstanding water-power reserves in 12 public-land States and Alaska and the elimination of 94,143 acres from such reserves in 12 States, with a net decrease in the total reserved area in 22 States and Alaska to 6,618,854 acres. Reservoir-site reserves remained unchanged, with a total of 137,172 acres withdrawn. Field supervision, in conjunction with the Water Resources Branch, of power projects for the Federal Power Commission involved supervision of construction and operation on 163 projects, continuation of studies of cost accounting on 9 of these projects, and investigations and reports on 3. Field supervision was given to 168 power projects holding permits and grants from the Department of the Interior.

Mining and Oil- and Gas-leasing Divisions

The work of the Mining and Oil- and Gas-leasing Divisions consists of inspectional and regulatory supervision of mineral prospecting and development on public and Indian lands and naval petroleum reserves.

The Mining Division is charged with supervision of all operations for the discovery and development of deposits of coal, potassium, sodium, phosphate, and oil shale on public land; of sulfur in New Mexico and Louisiana; of gold, silver, and quicksilver on certain land grants; and of all minerals except oil and gas on restricted, allotted, and tribal Indian lands. This supervisory and regulatory work during the fiscal year was accomplished through seven field offices at Denver, Colo., Billings, Mont., Carlsbad, N. Mex., McAlester and Miami, Okla., Salt Lake City, Utah, and Juneau, Alaska, the latter through a cooperative agreement with the Department of Mines, Territory of Alaska, approved May 4, 1935.

The work of the Oil- and Gas-Leasing Division includes inspectional and regulatory supervision of all operations for the discovery, development, and production of petroleum and natural gas on public land of the United States, on naval petroleum reserves, and on all Indian land subject to departmental jurisdiction, both tribal and allotted, except the Osage Reservation, Okla. The work was accomplished during the year through 16 field offices and suboffices at Los Angeles and Taft, Calif., Roswell and Farmington, N. Mex., Tulsa, Oklahoma City, Ardmore, Holdenville, and Drumright, Okla., Denver, Colo., Casper,

Midwest, and Thermopolis, Wyo., Billings and Great Falls, Mont., and Salt Lake City, Utah.

Public land.—The number of public-land properties under supervision of the Mining Division at the end of the year was 680, a decrease of 4 since June 30, 1940. Coal properties in 14 States and Alaska decreased 14, to 553; potash properties in 2 States remained the same, although the consolidation of two leases reduced the number by 1, to 20; sodium properties in 7 States increased 15, to 90; phosphate properties in 3 States decreased to 6; sulfur properties in 1 State were again 11. The decrease in coal properties resulted indirectly from the Secretary's instructions of January 24, 1934. The Secretary's Order No. 914 of April 5, 1935, and No. 1294 of July 2, 1938, restricted further issuance of potash and phosphate leases and permits. In prospecting for these minerals 187 boreholes were drilled during the year, aggregating 19,023 feet.

Accidents to employees are generally fewer in mines under departmental supervision than in competitive mines not on Government land. Of the 45 awards to coal and potash mine operators made by the Joseph A. Holmes Safety Association for the calendar year 1940, 6 were made to departmental lessees. The Sentinel of Safety, the highest award for safety in coal mining given in the National Safety Competition, was won by the Rock Springs No. 4 mine of the Union Pacific Coal Co., operating under a Government lease.

The number of public-land properties under supervision of the Oil- and Gas-Leasing Division decreased about 19 percent, to a total of 5,269, involving 5,477,671.79 acres in 20 States and Alaska. Drilling activity on public land during the fiscal year included the commencement of 415 new wells and the completion of 486 wells, of which 357 were rated as productive of oil and gas and 129 as barren. The total number of public-land wells under supervision on June 30, 1941, was 9,748, including 5,100 capable of oil or gas production. Production of petroleum from public land in the fiscal year 1941 was about 5 percent more than in the preceding year; production of gas increased about 1.3 percent; and production of natural gasoline increased about 35 percent.

The work on unit and cooperative plans during the year involved complex problems of engineering, geology, and law resulting for the most part from activities under approved agreements. Only 3 new plans were approved and 3 were canceled, leaving a net total of 117 approved plans involving an area of 1,705,761 acres. During the year production was obtained from 15 of the approved plans in an aggregate amount of about 46 percent of the total oil production on public land, 56 percent of the gas production, and 61 percent of the gasoline production. These products were obtained in accordance with engineering practices adopted to avoid waste of natural resources pursuant to the terms of plans of development under direct supervision.

One new unit operator was designated during the year, one resignation was accepted, two modifications were approved, collective bonds were authorized for three areas, and participating areas were established or revised for six agreements.

Indian land.—The number of Indian-land properties under supervision of the Mining Division during the year was 298 in 13 States. These properties involved 53 lead and zinc leaseholds in the Quapaw Reservation, Okla., from which \$908,116.91 accrued, an increase of 29.75 percent over the preceding year; 51 coal leaseholds on segregated Choctaw and Chickasaw land and restricted allotted land in Oklahoma, which produced 388,741.55 tons in 1940, an increase of 33,390.99 tons over the preceding year, and revenue accruals from royalties, bonuses, and sale of coal lands amounted to \$75,157.08; 1 leased and 3 unleased purchased tracts and 1 asphalt lease on segregated land, 1 coal transportation lease, and 1 lead and zinc lease on restricted allotted land in Oklahoma; and 187 properties in 12 western States, of which 13 were agency coal mines, 50 were coal permits and leases, 49 were individual coal mines, 32 were metalliferous leases, and 43 were nonmetalliferous leases other than coal leases.

Oil and gas supervision involved 4,123 leaseholds, 4,295 wells, and aggregate bonus, royalty, and rental accruals estimated at \$1,500,000 for Indian beneficiaries in 8 States and 33 different tribes. The cooperative duties involved royalty accounting; appraisals of bonuses, royalty offers, and pollution damages; assistance to lessees of Indian land on operating problems; and assistance to agency officials and tribal councils on technical phases of leasehold development and administration.

Naval petroleum reserves.—On behalf of the Navy Department supervision was continued during the year over operations for the production of oil and gas within Naval Petroleum Reserves Nos. 1 and 2, in California, and for the conservation of shut-in production within Naval Petroleum Reserve No. 3, in Wyoming. Production from 285 wells on Reserves Nos. 1 and 2 aggregated 3,503,598 barrels of petroleum, 1,886,742,000 cubic feet of natural gas, and 9,657,075 gallons of natural gasoline and had an aggregate royalty value of \$798,108.83.

Public Works Projects

Under the supervision of the personnel of the Oil- and Gas-Leasing Division, expenditures aggregating \$1,470.30 were made during the year from Public Works funds allotted for conservation work. Seven projects were completed in three States, involving the proper plugging and abandonment of six wells and the repair and conditioning of two water wells, all on public land.

Summary of Field Activities, by States

Alabama.—Supervised 1 lease and 1 prospecting permit for coal and 1 lease for oil and gas on public land.

Alaska.—Supervised 1 power project, 2 leases, 7 prospecting permits, and 3 licenses for coal, and 49 leases and 39 prospecting permits for oil and gas on public land.

Arizona.—Supervised 18 power projects, 1 prospecting permit for coal and 3 for sodium, 37 leases and 3 prospecting permits for oil and gas on public land, 4 agency coal mines, 1 guano lease, 1 coal permit, and 16 leases for gold, asbestos, manganese, and carnotite on Indian land. Surveyed 35 linear miles of river basin.

Arkansas.—Supervised 1 power project.

California.—Investigated 2 tracts in Santa Barbara County and investigated oil and gas developments in the southern and central parts of the State. Made preliminary investigations of power and storage resources of the upper Sacramento, Tuolumne, Kings, and Kern Rivers. Supervised 99 power projects, 1 prospecting permit for coal, and 34 for sodium, 1 sodium lease, 5 potash leases, 862 leases and 28 prospecting permits for oil and gas on public land, 1 coal lease and 2 gold leases on Indian land, 22 oil and gas leases on naval petroleum reserves, and abandonment of 39 wells on Naval Petroleum Reserve No. 1.

Colorado.—Supervised 13 power projects, 86 leases, 17 prospecting permits, and 6 licenses for coal, 1 sodium lease, 1 sodium prospecting permit, 243 leases and 263 prospecting permits for oil and gas on public land, and 2 coal leases on Indian land. Mapped geology of the Coalmont district. Investigated 5 oil and gas developments in State.

Idaho.—Surveyed 2 reservoir sites and 2 dam sites. Supervised 36 power projects, 2 leases and 5 prospecting permits for coal, 1 phosphate lease, 18 leases for oil and gas on public land, and 2 limestone leases on Indian land.

Kansas.—Completed structural and oil and gas development investigation in Finney, Grant, Haskell, and Kearney Counties. Supervised 27 leases for oil and gas on public land and 5 leases for oil and gas on Indian land.

Louisiana.—Supervised 63 leases for oil and gas on public land.

Michigan.—Supervised one lease for oil and gas on public land and seven leases for oil and gas on Indian land.

Mississippi.—Supervised one power project and two leases for oil and gas on public land.

Montana.—Resumed geologic mapping of Sweetgrass Hills, Toole and Liberty Counties, and investigated oil and gas development in the State. Examined 3 dam sites on Flathead River. Supervised 56 power projects, 91 leases, 11 prospecting permits, and 46 licenses for coal, 5 phosphate leases, and 430 leases and 53 prospecting permits for oil and gas on public land, 3 agency coal mines, 18 coal permits, 1 bentonite lease, 1 stone lease, 6 metalliferous leases, and 71 leases for oil and gas on Indian land.

Nebraska.—Supervised three leases for oil and gas on public land.

Nevada.—Supervised 18 power projects, 5 coal prospecting permits, 8 sodium permits, 23 leases and 18 prospecting permits for oil and gas on public land, and 11 marl leases on Indian land.

New Mexico.—Continued subsurface mapping in Lea and Eddy Counties for mineral classification; and initiated subsurface correlation of potash beds in Eddy County. Supervised 6 power projects, 22 leases and 19 prospecting permits for coal, 47 permits for sodium, 15 potash leases, 11 sulfur permits, 1,354 leases and 57 prospecting permits for oil and gas on public land, 6 agency coal mines, 2 coal leases, 49 individual Indian coal mines, 1 gold lease, and 6 leases for oil and gas on Indian land. Repaired 1 water well on public land.

New York.—Supervised two leases for oil and gas on Indian land.

North Dakota.—Supervised 46 leases, 1 prospecting permit and 23 licenses for coal, 2 prospecting permits for sodium, 18 leases and 14 prospecting permits for oil and gas on public land, and 24 coal permits, 2 gravel leases, and 1 gravel permit on Indian land.

Oklahoma.—Completed, through the Geologic Branch, structural mapping in the Cement oil and gas field, Caddo and Grady Counties. Supervised 52 leases and 2 prospecting permits for oil and gas on public land, 30 leases and 21 mining permit leases for coal, 1 leased purchased tract and 3 unleased purchased tracts for coal, 1 asphalt lease, and 53 zinc-lead leases on Quapaw Indian land, and 3,956 leases for oil and gas on Indian land.

Oregon.—Supervised 35 power projects, 4 coal and 5 sodium prospecting permits, 8 leases and 3 prospecting permits for oil and gas on public land, and 2 volcanic cinder permits on Indian land. Investigated power value of Cheteo River.

South Dakota.—Supervised 5 leases, 2 prospecting permits, and 3 licenses for coal, and 22 leases for oil and gas on public land.

Utah.—Supervised 14 power projects, 63 leases, 28 prospecting permits for coal, 1 phosphate lease, 234 leases and 126 prospecting permits for oil and gas on public land, and 6 gilsonite leases on Indian land. Abandoned 2 oil and gas wells on public land.

Washington.—Surveyed 1 dam site, 55 linear miles of river basin, and the Nisqually glacier. Supervised 22 power projects, 1 lease and 7 prospecting permits for coal, 1 lease for oil and gas on public land, 13 metalliferous leases, 5 gravel permits, and 33 leases for oil and gas on Indian land.

Wisconsin.—Supervised two power projects.

Wyoming.—Continued geologic mapping in the eastern parts of Niobrara and Weston Counties and coal investigations in Laramie Basin in Albany County. Completed structural maps of Gunn Quealy coal area, Sweetwater County, and of North LaBarge and Piney LaBarge unit areas, Sublette County. Examined 2 tracts in Teton County and 3 tracts in Lincoln County for mineral classification; began a structural investigation of the Wertz Dome unit area, Carbon and Sweetwater Counties, and an economic investigation of the Superior Coal district, Sweetwater County. Supervised 9 power projects, 67 leases, 33 prospecting permits, and 22 licenses for coal, 1 sodium lease, 1,302 leases and 109 prospecting permits for oil and gas on public land, and 2 coal leases and 43 leases for oil and gas on Indian land. Tested shut-in pressures on Naval Petroleum Reserve No. 3 for the purpose of conserving production. Performed technical supervision at Emergency Conservation Camp 858, established for conserving coal deposits. Conditioned 1 water well and abandoned 4 oil wells on public land.

Work on Publications

Texts.—The book publications of the year numbered 86 in the regular series and 23 pamphlets and circulars for administrative use. The total number of pages was 12,219. Besides these printed publications 64 brief papers were issued in mimeographed form as memoranda for the press.

Illustrations.—The illustrations prepared consisted of 584 drawings and photographs. Seven hundred and nineteen illustrations to accompany 51 reports were transmitted to the printer, and 575 proofs and 97 edition prints were examined.

Geologic map editing and drafting.—Geologic maps of the Grants Pass and Sumpter quadrangles, Oregon, were drawn and prepared for engraving; the color schemes for the maps were prepared and color proofs were read. The maps were published by the Oregon Department of Geology and Mineral Industries. A wall map of the United States showing coal resources was revised for publication. A reconnaissance map of southeastern New Mexico, showing roads, elevations, and springs, is being drafted. The geologic maps for the Montevallo-Columbiana, Ala., folio were revised and their printing was in part completed. One hundred and fifty maps, sections, and illustrations, many of which were for national defense and conservation programs, were drawn, and some were hand-colored. Maps and illustrations for 22 reports were edited. Proofs of 49 geologic maps were read. Most of these were for national defense and conservation programs.

Distribution.—A total of 643 publications, comprising 89 new books and pamphlets, 96 new or revised topographic and other maps, 49 Tennessee Valley Authority maps with contours, 270 reprinted topographic and other maps, 104 new advance sheets, and 35 reprinted advance sheets were received during the year. Several special pamphlets and forms for administrative use were also received and distributed. The total units of all publications received numbered 155,990 books and pamphlets and 1,221,815 topographic and other maps, a grand total of 1,377,805. The division distributed 81,275 books and pamphlets, 1,620 geologic folios, and 1,218,265 maps, a grand total of 1,301,160, of which 1,592 folios and 1,095,457 maps were sold. The net proceeds (gross collections less copying fees and amounts refunded) from the sales of publications were \$43,352.97, which included \$42,958.43 for topographic and geologic maps and \$394.54 for geologic folios. In addition to this, \$32,571.07 was repaid by other agencies of the Federal Government at whose request maps or folios were furnished. The total net receipts, therefore, were \$75,924.04.

Engraving and printing.—During the year 19 special maps and 77 newly engraved topographic maps, 2 of which were revised maps, were printed and delivered. Corrections were engraved on the plates of 215 maps. Reprint editions of 246 engraved topographic maps and 24 photolithographed State and other maps were printed and delivered. In addition, 51 new topographic maps had been engraved and were in press. Of new and reprinted maps, 366 different editions, amounting to 1,056,090 copies, were delivered. Small sale editions of 27 planimetric, 11 advance photolithographed, and 73 multicolor photolithographed topographic maps, totaling 137,492 copies, were printed from plates previously made for official purposes.

A large amount of repay work was done for 73 other units of the Federal and State Governments.

Transfer impressions and direct plate prints, numbering 716, were made.

Of topographic maps and contract and miscellaneous work of all kinds, a grand total of 2,349,396 copies was printed and delivered.

The photographic laboratory made 8,041 negatives, 30,447 prints, 2,902 photolith press plates, 170 intaglio etchings, and 10 celluloid transfers and mounted 1,737 prints.

Library

The total number of books and separate items circulated by the library amounted to more than 41,000. About 14,000 new books, periodicals, maps, and other items were received, representing a decrease from last fiscal year of nearly 5,000. This decrease is due largely to war conditions abroad that have retarded both publication and sending.

Funds

For the fiscal year 1941 there was available for expenditure under the direction of the Geological Survey a total of \$7,823,622. Of this amount, \$3,686,910 was appropriated directly to the Geological Survey and \$4,136,712 was made available by other Federal agencies and by States and their subdivisions. In addition, \$8,500 was allotted from the appropriation for contingent expenses of the Department of the Interior for miscellaneous supplies.

Funds available to the Geological Survey in 1941 from all sources

General administrative salaries, Interior Department Appropriation Act.....	\$150,000	
Topographic surveys:		
Interior Department Appropriation Act.....	\$759,010	
States, counties, and municipalities.....	315,120	
War Department.....	1,210,593	
Tennessee Valley Authority.....	50,000	
Public Roads Administration.....	39,162	
Public Works Administration.....	28,313	
Miscellaneous repay.....	64,988	
		2,467,186
Geologic surveys:		
Interior Department Appropriation Act.....	500,000	
States, counties, and municipalities.....	35,453	
		535,453
Strategic and critical minerals:		
Interior Department Appropriation Act.....	145,000	
First Supplemental Civil Functions Appropriation Act, 1941.....	100,000	
Public Works Administration.....	1,154	
State Department (for work in other American republics).....	25,000	
		271,154
Mineral resources of Alaska:		
Interior Department Appropriation Act.....	60,000	
War Department.....	45,013	
		105,013

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Gaging streams:

Interior Department Appropriation Act.....	\$1, 224, 500
States, counties, and municipalities.....	968, 100
Permittees and licensees of Federal Power Commission.....	23, 631
Department of the Interior:	
Bureau of Reclamation.....	20, 643
Office of Indian Affairs.....	26, 402
National Park Service.....	350
Office of Land Utilization.....	15, 000
Fish and Wildlife Service.....	3, 800
War Department:	
Office of Chief of Engineers.....	689, 069
Mississippi River Commission.....	4, 040
Navy Department.....	2, 338
State Department.....	47, 000
Department of Agriculture.....	78, 622
Department of Justice.....	1, 079
Federal Power Commission.....	431
Tennessee Valley Authority.....	51, 000
National Resources Planning Board.....	17, 446
Public Works Administration.....	7
	\$3, 173, 458

Classification of lands:

Interior Department Appropriation Act.....	105, 000
Miscellaneous repay.....	195

Printing and binding, Interior Department Appropriation Act.....	105, 195
Preparation of illustrations, Interior Department Appropriation Act.....	130, 000
Engraving and printing geologic and topographic maps:	25, 000

Interior Department Appropriation Act.....	\$173, 400
General Land Office.....	9, 700
Miscellaneous repay.....	202, 247
	385, 347

Mineral leasing:

Interior Department Appropriation Act.....	315, 000
Navy Department.....	52, 500
Office of Indian Affairs.....	100, 000
Public Works Administration.....	6, 680
Miscellaneous repay.....	656
	474, 836

Payment from proceeds of sale of water, special account.....	980
--	-----

7, 823, 622

Appendix

Summary of outstanding mineral withdrawals and classifications

[June 1941, in acres]

State	Coal		Oil		Oil shale		Phosphate		Potash
	With- drawn	Classi- fied as coal land	With- drawn	Classi- fied as oil land	With- drawn	Classi- fied as oil shale land	With- drawn	Classi- fied as phos- phate land	With- drawn
Alaska.....		56, 993							
Arizona.....	139, 415								
Arkansas.....		61, 160							
California.....	17, 603	8, 720	1, 178, 392						90, 324
Colorado.....	4, 142, 233	3, 082, 272	215, 370		1, 172, 778	952, 239			
Florida.....							66, 796	120	
Idaho.....	11, 520	4, 603					276, 239	270, 036	
Louisiana.....			466, 990	4, 233					
Montana.....	4, 376, 777	10,803,667	1, 336, 697	67, 651			280, 089	3, 833	
Nevada.....	83, 673								39, 422
New Mexico.....	3, 298, 834	1, 074, 723							9, 282, 160
North Dakota.....	5, 954, 364	11, 178, 286	84, 894						
Oregon.....	4, 361	18, 887							
South Dakota.....		250, 093							
Utah.....	3, 152, 792	1, 395, 862	1, 035, 034		2, 737, 274	2, 703, 755	277, 344	2, 937	
Washington.....	691, 801	141, 444							
Wyoming.....	2, 143, 991	6, 847, 235	541, 777		2, 079, 897	425, 214	989, 133	25, 293	
Total.....	24, 017, 364	34, 923, 945	4, 859, 154	71, 884	5, 989, 949	4, 081, 208	1, 889, 601	302, 219	9, 411, 906

¹ Includes 3,151 acres of coal land reserved for use of the United States (coal reserve No. 1).

² Includes 13,578 acres withdrawn as helium reserve.

³ Includes 2,078 acres of coal land reserved for use of the United States (coal reserve No. 2).

Definitions of known geologic structure, fiscal year 1941

State	Field	Date promulgated	Field area (acres)
Kansas	Holcomb Area of the Hugoton	Mar. 3, 1941	168,055
New Mexico	Loco Hills	Feb. 7, 1941	10,736
Wyoming	Bunker Hill	Nov. 4, 1940	2,288
Do	Grass Creek ¹	Mar. 14, 1941	3,504
Do	Mahoney Dome ¹	Oct. 18, 1940	8,509
Do	North LaBarge	Apr. 9, 1941	840

¹ Revised.

Mineral production from public land and revenues therefrom, fiscal year 1941

[No production in Michigan, Nebraska, Nevada, and Oregon]

State	Petroleum (barrels)	Natural gas (M cubic feet)	Gasoline (gallons)	Coal (short tons)	Potassium salts (short tons)	Sodium salts (short tons)	Phosphate rock (long tons)	Accrued revenues
Alabama				61,416				\$6,141.60
Alaska				186,964				9,365.73
Arizona				8				22.00
California	13,614,366	32,396,923	7,094,644	21	15,073	110,829		2,067,476.52
Colorado	1,073,389	1,492,175	81,042	446,059		433		125,359.41
Idaho				3,717				954.00
Kansas								931.27
Louisiana	143,319	1,348,820	82,513					32,443.68
Montana	480,651	3,027,549	13,176	209,014			37,387	95,733.44
New Mexico	9,974,606	23,795,412	16,754,636	75,110	1,579,117	14,322		1,213,303.68
North Dakota	2,491			686,146				39,641.77
Oklahoma	104,864		114,701					8,757.34
South Dakota				2,505				385.38
Utah	15,345	3,921,473		1,519,893			1,307	183,458.02
Washington				27,255				2,725.50
Wyoming	16,569,377	13,445,231	27,770,759	1,525,204				1,905,894.60
Total	41,978,408	79,427,583	51,911,471	4,743,312	1,594,190	125,584	38,694	5,692,593.94
Total, 1940	39,843,241	77,380,171	39,474,930	3,943,568	663,855	106,838	9,425	6,076,730.13

General summary of cases involving land classification

Class of cases	Record for fiscal year 1940-41						Record since receipt of first case	
	Pending July 1, 1940	Received during fiscal year	Total	Acted on during fiscal year	Pending June 30, 1941	Gain or loss during fiscal year	Received	Acted on
Mineral leasing laws:								
Permit applications	18	156	174	166	8	+10	63,176	63,168
Lease applications	391	1,890	2,281	2,206	75	+316	14,666	14,591
Committee cases							13,322	13,322
Concurrence	119	2,713	2,832	2,786	46	+73		
Interference (surface rights)	5	93	98	94	4	+1		
Unit operation plans	6	5	11	5	6		1,685	1,679
Cases involved in unit plans	25	3	28	18	10	+15	5,875	5,865
Development (drilling operations, etc.)	3	79	82	72	10	-7	17,843	17,833
Miscellaneous		717	717	717			8,669	8,669
Mineral classification:								
Oil and gas (including "349")	124	541	665	664	1	+123	34,095	34,094
Miscellaneous								

General summary of cases involving land classification—Continued

Class of cases	Record for fiscal year 1940-41						Record since receipt of first case	
	Pending July 1, 1940	Received during fiscal year	Total	Acted on during fiscal year	Pending June 30, 1941	Gain or loss during fiscal year	Received	Acted on
Water and power:								
Federal Power Commission:								
Preliminary permits.....	8	85	93	93	-----	+8	742	742
Licenses.....							28	28
Determinations under Sec. 24.....	7	40	47	42	5	+2	831	826
Classification.....		2	2	1	1	-1	571	570
Rights-of-way.....	26	121	147	127	20	+6	7,773	7,753
Irrigation project reports.....	4	3	7	6	1	+3	952	951
Miscellaneous.....								
General information:								
General Land Office (co-ops., etc.)..	79	1,146	1,225	1,185	40	+39	-----	-----
Indian Office.....							9,549	9,549
Miscellaneous.....								
Total.....	815	7,594	8,409	8,182	227	+588	-----	-----

Topographic mapping by the Geological Survey in the United States, Puerto Rico, and Hawaii, to June 30, 1941

State	Total area mapped during fiscal year 1941 (square miles)										Types of standard surveys with contours, fiscal year 1941 (square miles)			Total area mapped to June 30, 1941 (square miles)	Percentage of total area of State mapped to June 30, 1941 ²	Control, fiscal year 1941				
	For publication on standard scales, with contour intervals from 5 to 50 feet, mapped on field scale of 1 to—										New survey					Resurvey	Revision	Spirit levels (miles)	Transit traverse (miles)	Triangulation stations established
Planimetric on scale of 1 to —1	48,000	24,000	4,800	5,000	10,000	12,000	15,840	24,000	48,000											
Alabama.....								160	1,416	1,453	123		24,102	292	154					
Arizona.....									2,208	306	1,902		31,276	259			21			
Arkansas.....								93	74	93			24,367							
California.....								47	2,270	156	1,853	308	129,349	1,046			112			
Colorado.....						19			194	26	187		57,688	76	6		30			
Connecticut.....													5,009							
Delaware.....													2,057							
District of Columbia.....													69							
Florida.....									993	993			7,928	160	692					
Georgia.....			3 45					48	36		425		25,202							
Idaho.....									123	64		59	37,272							
Illinois.....									642	570	56	16	42,721	97						
Indiana.....								561	561				6,437	81	321					
Iowa.....								149	173	173	149		14,154							
Kansas.....										58			65,615	1,679	172					
Kentucky.....													27,559							
Louisiana.....		1,409						58	2,886	2,236	650		11,646	173						
Maine.....													24,704	2,555	895		7			
Maryland.....													10,577	48	41					
Massachusetts.....								410		410			8,257							
Michigan.....								488		384			15,803							
Minnesota.....													9,542							
Mississippi.....									863	863			8,683		435					
Missouri.....								156	2,051	1,638	528	53	58,011	277	67					
Montana.....			12						421	421			38,245	216						
Nebraska.....													28,225							
Nevada.....									157		157		43,536							
New Hampshire.....									215		215		9,304							
New Jersey.....													7,836							
New Mexico.....													35,632							
New York.....								96	3,107	2,016	1,091		49,576	768						
North Carolina.....											96		19,574							
North Dakota.....													15,871							
Ohio.....													41,222	77						
Oklahoma.....								24				24	41,342				59 1			

See footnotes at end of table.

Topographic mapping by the Geological Survey in the United States, Puerto Rico, and Hawaii, to June 30, 1941—Continued

State	Total area mapped during fiscal year 1941 (square miles)										Types of standard surveys with contours, fiscal year 1941 (square miles)			Total area mapped to June 30, 1941 (square miles)	Percentage of total area of State mapped to June 30, 1941	Control, fiscal year 1941			Triangulation stations established
	Planimetric on scale of 1 to —		For publication on standard scales, with contour intervals from 5 to 50 feet, mapped on field scale of 1 to—								New survey	Resurvey	Revision			Spirit levels (miles)	Transit traverse (miles)		
	48,000	24,000	4,800	5,000	10,000	12,000	15,840	24,000	48,000										
Oregon										257	476		34,389	35.5	509		20		
Pennsylvania													41,752	92.1					
Rhode Island													1,214	100.0					
South Carolina													15,772	50.8					
South Dakota													20,750	26.9					
Tennessee			3 43	3 304	3 2,233			3 8		113	2,269	23,998	56.8						
Texas										260	1,428	91,446	34.2	441	106		15		
Utah										98		19,984	23.5						
Vermont										51		9,150	95.2						
Virginia										397	428	38,097	93.3						
Washington								148				43,181	63.3		64		47		
West Virginia								679		332	347	24,181	100.0						
Wisconsin												20,273	36.1		805		6		
Wyoming									32			35,322	36.1	65					
Total	1,847	1,409	100	304	2,497	19	1,085	2,470	21,679	13,772	13,887	1,397,920	46.3	9,666	4,370		325		
Hawaii												6,435	100.0						
Puerto Rico												1,009	29.4	540			183		

¹ Compiled from aerial photographs with field examination. Show culture, drainage, and woodland, but no contours.² The Bureau of the Census has established new values for State areas upon which the percentage of area mapped is based.³ Mapped from aerial photographs by stereophotogrammetric methods.



R. R. SAYERS, Director

THE FUNCTIONS and activities of the Bureau of Mines have always been fundamentally conservational. Its technologic and scientific investigations have served to promote efficient production and utilization of irreplaceable mineral resources; its studies in economics and statistics have constituted invaluable guides in planning such production and use; and its health and safety work has aided not only in preventing waste of mineral resources but also in conserving another important national asset—the well-being of workers in the mineral industries. During the fiscal year 1941, however, the abnormal demand for metals and minerals required by the national-defense program brought the Bureau's technologic work into sharp focus; the need of defense planning agencies for accurate and comprehensive data on sources, stocks, and consumption of minerals gave new importance to the work on economics and statistics; and the possibility of the need for an emergency civilian first-aid and recovery program made the work on health and safety doubly valuable.

Because of the prominent role of manganese in the preparedness program, the Bureau was granted funds shortly after the beginning of the fiscal year to investigate methods of processing low-grade manganese ores that in the past have failed to yield material suitable for the preparation of ferromanganese—an alloy indispensable in the manufacture of steel. This work is especially important at this time because virtually no manganese ores of ferro grade exist in the United States, and heretofore more than 90 percent of the country's manganese requirements have been imported from overseas; consequently, the development of successful processes for treating low-grade ores from domestic deposits that contain large reserves of manganese will play a vital part in making the country self-sufficient should foreign shipments be cut off. The investigations comprise laboratory studies to find technically and economically sound processes for recovering manganese, and the construction and operation of pilot plants in

which reliable engineering and operating data essential to the design of full-scale plants can be obtained.

The results of the laboratory investigations to date indicate good probability of success; and on June 30, 1941, an ore-dressing pilot plant at Boulder City, Nev., was 70 percent completed, construction of a pilot plant at Chamberlain, S. Dak., to recover manganese nodules from shale was well under way, an electrolytic pilot plant was under construction, and a hydrometallurgical pilot plant was rapidly nearing completion.

The search for domestic deposits that might be a source of strategic minerals was continued vigorously; more than 500 deposits were examined, and 36 of them were explored by surface trenching, shaft sinking, tunneling, and drilling. Among the notable results achieved in this work was the discovery of high-grade tungsten ore in Idaho with enough indicated tonnage to class the deposit as one of major importance. It is now being developed commercially, and production is expected to begin in August 1941. A valuable source of chromite was explored in Montana and is being developed with funds provided by the Reconstruction Finance Corporation. Appreciable amounts of antimony, manganese, and mercury were also brought to light. Although they are, for the most part, of subcommercial grade, nevertheless they constitute important reserves that could be developed if necessary.

Other technologic activities concerned with national defense include testing of western coals for use in making coke for munitions plants; a study of the inflammability or explosibility of metallic dusts, especially magnesium; a survey of the quantity and geographic distribution of crude oils suitable for the manufacture of aviation gasoline; a study of the location, capacity, and type of existing petroleum refineries; semiannual surveys showing the characteristics of motor gasoline available throughout the country; production of more than 16 million cubic feet of helium, of which 93 percent was supplied to the Government, principally for the Army and Navy; development of a domestic supply of graphite that can be used in place of imported material; investigation of low-grade bauxite deposits as sources of aluminum; research on American kyanite for use in making refractories; and assistance in investigations of explosions at plants manufacturing explosives.

As the Government's chief agency in the field of mineral economics and statistics, the Bureau was called upon continually for data needed in planning the defense program, and its reservoir of technical and economic information proved invaluable to agencies concerned with problems of procurement, price, supply, and demand. Many of the Bureau's commodity specialists also acted as consultants to defense agencies or served in important posts on special defense committees,

and there was a greatly augmented demand from members of the Congress, other Government agencies, the mineral industries, and the public for information on a wide variety of economic subjects. The staff of Bureau specialists in South America was increased to five, and significant information was obtained with respect to manganese, chromite, antimony, mercury, and other strategic minerals produced in Latin America.

All of the usual published reports on economics and statistics acquired greater significance; many of them were enlarged or supplemented to meet particular defense needs, and issuance of the report on iron and steel scrap was changed from a quarterly to a monthly basis. A determined effort was made to expedite release of preprints of chapters from the Minerals Yearbook; by the close of the year 39 chapters had been issued, compared with 14 at the close of the fiscal year 1940. The release date for the complete volume will be several months in advance of that for the preceding year. To meet particular requirements of various agencies dealing with defense, special studies were made, among others, of coke-producing capacity, destination of coke shipments, aviation gasoline, oil-pipe-line mileage and capacity, petroleum supply and demand on the Atlantic coast, probable zinc output, consumption and stocks of aluminum and magnesium, zinc-smelting capacity, bauxite reserves, ferro-alloy-production capacity, and stocks of nonferrous scrap metals.

One of the outstanding features of the work on health and safety in relation to national defense was the training of nearly 2,500 first-aid instructors during the year, bringing the total so trained to nearly 15,000. These persons are distributed among two-thirds of the States of the Union and would be available, without loss of time, for civilian or military first-aid instruction in an emergency. In addition, more than 3,000 mine workers were trained in the use of gas masks, oxygen breathing apparatus, and methods of recovery after fires and explosions in confined places, such as mines and tunnels. More than 75,000 persons have now been trained in this work, and they would form the nucleus of an efficient corps for civilian rescue work should such be required. The Bureau's efforts to develop adequate safeguards against gases, dusts, and other atmospheric contaminants were also intensified to meet additional hazards introduced by rapidly expanding activity in mineral industries as a result of the preparedness program.

In addition to this work to promote national defense, notable progress was made during the year in the normal activities of the Bureau designed to increase efficiency, conserve resources, and promote safety in the mineral industries. Studies on the preparation of subbituminous coals and lignites resulted in the development of a process for removing excess moisture, thus preventing slacking and

making them more suitable for industrial and domestic use. The studies also showed that the tendency of ashes and slags to adhere to boiler tubes, and thereby decrease fuel efficiency, can be prevented by proper furnace design and operation and that Washington, Oklahoma, and Kansas coals can be used to make metallurgical coke, although better results are obtained by blending different coals, such as an Oklahoma coal and a low-volatile coal from Arkansas.

Experiments with drill steel resulted in finding a cheap alloy steel that has a 50-percent longer life than standard carbon steel. Research on the effects of blasting in quarries proved definitely that resulting earth vibrations are unlikely to damage structures at ordinary distances from the quarries.

Two new methods of determining carbon in steel were made practical; apparatus was devised that is capable of distinguishing between metals of slightly different composition (such as plain carbon steel and steel containing 0.22 percent copper); and the investigation of a new method of analyzing for metallic iron in the presence of oxides in slags was completed. Ore-dressing studies were instrumental in improving plant practice in crushing low-grade zinc ores, in beneficiating gypsum ores, in the flotation of mercury ore, and in the concentration of vanadium ore.

Work on high-sulfur crude oils demonstrated that the sulfur content of light distillates can be lowered by treatment with liquid sulfur dioxide; important new information was obtained concerning reservoir conditions in deep formations of Gulf Coast fields that contain condensable hydrocarbons under high pressure; and laboratory data now available indicate that there is an optimum rate of water advance with oil through porous rocks, which if exceeded will not increase materially the quantity of extractable oil.

A process consisting of gentle crumbling or scuffing has been developed to rub off the soft iron oxide that coats the sand grains of ores in the Birmingham district; this should increase output and decrease costs of mining. An instrument that may be attached to a boiler has been devised to detect the effect of embrittling mineral constituents of the boiler water before they can produce cracking in the riveted seams of the boiler; about 200 of these detectors are now in use on locomotives and stationary boilers.

Strikingly effective improvement in liquid-oxygen explosives, which substantially reduces the hazard of accidental inflammation by fire or spark, has led to the initiation of other studies on such explosives in cooperation with industry. Techniques in the administration of anesthetics have been developed that virtually eliminate the explosion hazard of mixtures of oxygen and gaseous combustibles such as cyclopropane and ether; helium is employed as a nonexplosive diluent.

The customary statistical canvasses and surveys were made to obtain data used in preparing the various chapters of Minerals Yearbook, as well as weekly reports on Pennsylvania anthracite and coke and crude-oil stocks; monthly reports on anthracite and coke, cement, coal-mine fatalities, coke production, crude-oil refining, explosives, international coal trade, international petroleum trade, manganese, mineral trade, natural gasoline, petroleum, petroleum demand, slab zinc, and zinc production; and quarterly reports on ferro-alloys, foreign minerals, gypsum, iron and steel scrap, and world petroleum prices. The annual surveys of employment and accidents in the mineral industries were continued to provide a measure of the progress made in safety; and safety trophies were awarded to mines and quarries that established the best safety records. Numberless inquiries with regard to economic and statistical information were received and answered.

As a part of the Bureau's efforts to guard the health of workers a study was made of the concentration of contaminants in the air of a zinc smelter, and suitable recommendations were made for control of the harmful conditions found; 12 new approvals were granted for devices to protect workers against inhalation of injurious gases and dust; 1,500 gas samples were analyzed in connection with work on ventilation and the causes of mine fires and explosions; and studies were made on exhaust gases from Diesel engines.

During the year 87,087 persons were trained in first aid and in mine rescue operations; 2,465 received certificates of training as first-aid instructors; 179 mines and plants were awarded certificates indicating that 100 percent of the personnel had completed first-aid training; 3,204 persons were trained in mine rescue work; 106 were given training in advanced rescue and recovery operations; and 1,075 mine officials and workers and 103 workers in the petroleum industry completed a course in accident prevention.

Assistance was given in conducting 64 first-aid contests; 16 new chapters of the Holmes Safety Association were organized; 12 safety exhibits were prepared and shown at fairs, expositions, and conventions; sound motion pictures dealing with safety were used 280 times; and the Bureau was represented at 913 safety meetings, at many of which the representative was the principal speaker.

Bureau personnel investigated 21 mine explosions and 16 mine fires and assisted in rescue and recovery work at virtually all of them where life was lost or property jeopardized. Deaths in mine explosions totaled 155, including 137 in 7 major disasters. This record is better than that for 1940, but it does not equal that of 1939, when no single disaster cost 5 or more lives. Complete safety inspections and reports, discussing both commendable and hazardous conditions and containing appropriate recommendations, were made on 21 mines,

and 70 miscellaneous accidents were investigated. A new safety station was established at Albany, N. Y., to serve the needs of that district, and funds have been provided for the establishment of another station at Mount Hope, W. Va.

Educational motion-picture films circulated by the Bureau depict mining operations and related manufacturing processes and show where minerals are found and how they are extracted from the earth, manufactured or refined, utilized, and conserved. The library at present comprises 3,200 sets aggregating 2,500,000 feet of film. The entire cost of production and providing prints for circulation is defrayed by prominent cooperating industrialists. The total attendance at showings of these films in 1941 was 10,910,000, as compared with 1,712,000 in 1930. Films loaned for use in selective service training and to other defense groups during the year are proving to be immensely valuable educational aids in defense and war activities.

The foregoing summary describes briefly some of the major activities of the Bureau in promoting national defense and conserving mineral resources. Details are given on succeeding pages. During the coming year most of these activities will be continued or extended, and some additional work will be undertaken to meet the needs of the national emergency.

Future Work

Perhaps the most important activities that will be inaugurated during 1942 are those authorized by the Coal Mine Inspection Act, approved May 7, 1941. This legislation provides for annual or necessary inspections and investigations in coal mines to obtain information relating to health and safety conditions, the causes of accidents involving bodily injury or loss of life, and the causes of occupational diseases originating in such mines. The act also provides that, in addition to being transmitted to the Congress, the information is to be used as a basis for determining effective expenditure of public funds made available for advancing health and safety and for preventing or relieving occupational diseases and as a basis for the preparation and dissemination of reports, studies, statistics, and other educational material pertaining to the protection or advancement of health and safety and the prevention or relief of accidents or occupational diseases in coal mines.

Funds appropriated to the Bureau on July 3, 1941, for carrying out this act provide for the services of 107 mine inspectors. There are about 14,000 mines, large and small, that produce coal in the United States. As 107 inspectors manifestly cannot inspect all of these mines, immediate attention will be directed to those mines employing 25 or more persons each, of which there are approximately 2,500. The inspectors will be carefully selected in accordance with

the qualifications for the positions set up by the Civil Service Commission. They will be placed under the direction of the supervisors of existing Bureau safety districts.

Most of the disastrous coal-mine explosions in the past few years were initiated by electricity or explosives. Both of these causes will be investigated under the new act in the effort to reduce existing hazards and prevent the introduction of new ones resulting from the rapid increase of coal-mine mechanization. The work will include tests of electrical equipment to determine its conformity to Bureau standards for "permissibility," and the inspection force will endeavor to bring about the universal use of permissible equipment in all coal mines. Harmful dusts, toxic gases, and high temperature and humidity are potential causes of occupational diseases among coal miners, who must work strenuously in poor light and under other adverse conditions. All of these factors will be studied to determine their physiological effect on miners.

A large amount of analytical work will be required—analyses of samples of dust taken from mine surfaces to determine whether enough rock dust has been added to keep the mixture of rock and coal dust below ignition and explosive limits and analyses of samples of mine atmospheres to determine the number, size distribution, and composition of suspended dust particles and the explosibility and respiratory harmfulness of the mine air. The present work on collection of coal-mine-accident statistics will be expanded, and the data will be correlated and supplied promptly to the mine inspectors and the public.

Special facilities are being provided for the preparation of detailed reports, summaries, and other informational material concerning the findings of the mine inspectors and the results of the investigations; these will be distributed upon request to newspapers, trade journals, mine operators, miners' organizations, health and safety associations, State mining departments, compensation commissions, and similar agencies.

New metallurgical work will include laboratory research to devise processes for recovering chromium, magnesium, and nickel from deposits of complex ores, and for producing alumina from low-grade bauxite, clays, and alunite. The annual requirements for chromite are about half a million tons and are met essentially by importation, which would be restricted or stopped entirely under actual war conditions. About half of the supply is used in making ferro-alloys, one-fourth for furnace refractories, and the remainder for chemicals and other uses. Domestic deposits of ore suitable for metallurgical or refractory purposes are of limited occurrence; but complex, off-grade deposits of chromite that are known to exist in several Western States

could be drawn upon for useful products if satisfactory processes could be developed.

Although the domestic production of magnesium is the greatest in history, serious shortages have occurred, largely because of the requirements of the aircraft industry for high-strength, low-weight structural materials. Magnesium is obtained from brine or sea water at present, but deposits of magnesium ores in Washington, California, and Nevada are potential sources of the metal if suitable processes can be found for extracting it. Several methods have been proposed, at least one of which offers promise of success.

Alumina (aluminum oxide) for conversion into aluminum metal is produced in the United States at present only from high-grade bauxite—material containing less than 7 percent silica. The known reserves of such commercial-grade bauxite are estimated to be sufficient to meet the requirements of the Nation for only 12 years at the 1940 rate of production. Therefore, extraction processes that are not limited to the high-grade material and can be employed to utilize the much larger domestic deposits of siliceous bauxite are seriously needed. Laboratory research will be conducted with respect to several methods that have been proposed but for which engineering details and data on cost of production are lacking.

Although the Amarillo (Texas) helium plant in 1941 supplied the greatest quantity of helium ever produced in one year, the Army and Navy have advised that even larger quantities will be needed for training men in barrage-balloon operations and for airships and varied uses in the fleet. Funds have been appropriated to the Bureau for the addition of a new production unit, which will increase plant capacity by 50 percent; for drilling four additional wells in the Cliffside gas field, with necessary pipe-line connections to the plant; and for a detailed survey of other sources of helium-bearing gas in the United States.

Review of the Year's Work

The many and varied activities of the Bureau during the fiscal year 1941 were administered by the Technologic, Economics and Statistics, Health and Safety, and Administrative Branches from offices in Washington, but were carried on largely in the principal mining districts of the country. Fourteen experiment stations (at Bartlesville, Okla.; Berkeley, Calif.; Boulder City, Nev.; College Park, Md.; Laramie, Wyo.; Minneapolis, Minn.; Norris, Tenn.; Pittsburgh, Pa.; Reno, Nev.; Rolla, Mo.; Salt Lake City, Utah; Seattle, Wash.; Tucson, Ariz.; and Tuscaloosa, Ala.) worked actively on problems connected with mining, utilization, and conservation of the Nation's mineral resources; a number of field offices were assigned special duties, particularly in connection with statistical studies of production and con-

sumption; and safety instructors moved on a flexible schedule, visiting mining establishments on request.

Technologic Branch

The Technologic Branch comprises the Coal and Mining Divisions, the Principal Mineralogist, and the Metallurgical, Petroleum and Natural-Gas, Nonmetals, and Explosives Divisions. The primary function of the branch is to conduct engineering and scientific research on methods of mineral production and use with a view to increasing efficiency and preventing waste, but during this period of national emergency particular attention is being given to problems relating to national defense that will yield major returns when most needed.

Coal Division

The Coal Division furnished to regular Government agencies and new defense agencies complete information and advice on purchasing fuel and steam-generating equipment. Studies of slags and ashes were continued, with the immediate object of increasing boiler efficiency, saving coal, and insuring continuous operation of boilers used for generation of electric power. Investigations concerning the resources of the western and northwestern sections of the country revealed coals that may be used for metallurgical coke and have developed methods for drying lignite to produce fuels suitable for industrial and domestic use. Work in the Experimental Coal Mine was continued with the purpose of preventing mine cave-ins and consequent interruption to production, and to this was added a study of hazards from industrial dusts. Work on the hydrogenation of coal was of great help in the development of new industrial products.

Fuel-economy service.—The Government of the United States is one of the world's largest producers of steam for heating and power. It is the purpose of the fuel-economy service to aid Federal agencies to purchase and utilize their fuel and equipment as efficiently as possible. This work was greatly increased during the present year, owing to the national defense program. Federal agencies were advised as to specifications and choice of proper fuel and boiler-plant equipment. Fuel-efficiency tests were made, as well as acceptance tests of new equipment. The work in boiler feed-water treatment was continued, and the War Department is planning to use this service for all of its plants to safeguard the vital production of power.

Coal analyses and fuel inspection.—During the fiscal year ended June 30, 1941, more than 9,000 reports were issued covering analyses and ash-fusion temperatures of coal purchased by the Government. These included data supplied to defense agencies for coal from 23

States, and during the last 6 months there was an increase of 70 per cent in the number of reports issued to these agencies. Coal-sampling trucks visited 375 mines in 17 States and collected 1,200 samples of coal.

Use of fuels.—A single, modern, large boiler may use as much as 50 tons of coal an hour—or possibly as much as 250,000 tons a year for regular operation. An increase of 1 per cent in boiler efficiency would save 2,500 tons of coal a year for such a unit. For the many boilers in use throughout the country, the total saving of coal would be enormous. Boiler efficiency can be increased by preventing deposits on the fire side of the boiler tubes, which cut down the heat transfer and result in heat losses. A study of the characteristics of ashes and slags has shown that their tendency to adhere depends, in part, on their melting temperature and viscosity, and that these in turn are affected by furnace design and operation. These results are proving of great value in increasing the operating efficiency of boilers now in use and in allowing more efficient design for new boilers that are being constructed.

Carbonization of coal.—Industrial expansion in the West, based upon the large quantities of low-cost electric power now available, is creating an increased demand for metallurgical coke. This demand for coke arises from the need for an increase of iron-and steel-producing capacity in that region as well as for munitions plants and for various metallurgical industries.

In response to this demand, the Bureau made an investigation of coals mined in Washington, Oklahoma, and Kansas and found coals that could be used for making coke. For example, a satisfactory coke was produced by blending an Oklahoma coal with a low-volatile coal from Arkansas. The technologic and economic ramifications of this study are great, and the coking properties of western coals are being investigated fully so that any new industry can make the best use of the natural resources close at hand.

Subbituminous coal and lignite.—The industrial development of the United States as a whole has depended in large part on the free and unlimited use of coal for heat and for mechanical and electrical energy. The northwestern section of this country will require a similar economical and abundant source of energy if it is to realize its fullest industrial expansion. High-grade coals like these of the eastern and central sections are not so common in the Northwest. Bureau of Mines investigation has shown, however, that subbituminous coal and lignite, which are abundant, can be steam-dried for as little as 30 cents a ton to yield materials of relatively high heating value suitable for use in the largest industrial boilers or in the smallest domestic heating units. Methods are being developed for burning these new fuels efficiently and automatically without

smoke. This work is helping the northwestern section of the country to obtain the fullest and most economical use of its own resources.

Hydrogenation of coal.—The lack of resources of natural oil has forced European nations to realize its full importance and to develop processes for treating coal with hydrogen to produce liquid fuels suitable for use in internal-combustion engines. The United States is not yet suffering from a shortage of resources of natural oil or gasoline, but the immediate possibilities of the process in the development of special fuels, lubricants, oils, aromatics, plastics, and fabrics are so great that no nation can afford to neglect them. The Bureau of Mines has been carrying out research on the hydrogenation of coal and coal tar for several years. The work has now progressed beyond the stage of laboratory studies, and a pilot plant has been built to allow continuous hydrogenation on a semicommercial scale.

Correlation of hydrogenation assays with chemical analyses and petrographic examinations of coals from 11 States has shown that it is possible to predict the yield of gasoline and, to a limited extent, difficulties that may be encountered in large-scale operation. Studies already completed have explained in part the function of the catalysts that are necessary in most hydrogenation processes. The results of this work, together with further investigation concerning the effect of operating conditions—temperature, pressure, time of contact, and nature of catalyst—will be a valuable guide in the development and production of new industrial products.

Experimental coal mine.—Incendiary bombs employing the hot, almost inextinguishable flames of magnesium powder are among the scourges of the present war. The people of the United States do not now face this destructive agent in their streets and homes; but there is constant and growing danger from the increasing use of metallic powders in our industries. Many metals and other materials, which in their normal state seem quite inert, become highly inflammable and even explosive when they are reduced to a dust. The experimental coal mine, including its laboratory testing equipment, is now being used to determine the hazards created by such dusts. Manufacturers have been advised as to the inflammability or explosibility of the dusts they are using, the exact conditions that are most dangerous, and means for eliminating the hazard. The work at the experimental coal mine includes a study of methods for extinguishing burning powders. Studies in the experimental mine also have included means for protecting mine roofs against destructive expansion and contraction and means for determining the load on supporting mine pillars so that cave-ins, with consequent interruption of production, frequently can be prevented.

Constitution of coal and miscellaneous analyses.—The picture of a tree whose trunk represents coal and whose branches indicate the many



derivable compounds is familiar to all chemists. These compounds include benzene, toluene, xylene, naphthalene, anthracene, and other basic chemicals from which are derived a host of materials vital to the defense industries and in the manufacture of explosives. The comparatively new coal-hydrogenation process has added special lubricants and liquid fuels to this list. Naturally the materials and amounts obtained by hydrogenation depend on the constitution of the coal used. It has been found that petrographic examination of extremely thin sections under the microscope will reveal the various constituents in their natural form and color and that the portions of the coal that are translucent in thin section are readily hydrogenated to give high yields of liquid fuels, whereas portions that are opaque are difficult to liquefy. From such petrographic studies of a number of western coals and of one eastern coal, it has been found possible to predict roughly the yields that might be expected of coke, gas, and such byproducts as benzene, toluene, and xylene. This investigation is helping all our industries, including those especially concerned with defense, to select the coal that will give them a large yield of the desired products.

Mining Division

The Mining Division emphasized defense work during 1941, specifically the investigation of domestic deposits of strategic minerals. More than 500 deposits in 29 States were examined, and 36 of the most promising were explored. This work involved large-scale sampling, surface trenching, shaft sinking, tunneling, and diamond or churn drilling or combinations thereof. It revealed substantial new quantities of antimony, chromium, manganese, and tungsten ores and smaller amounts of mercury ore. Most of these ores are of sub-commercial grade, but they constitute important reserves for use in an emergency. However, some ore of commercial grade was discovered, including high-grade tungsten ore in Idaho, chromite in Montana, antimony ore in Idaho, and mercury ore in Nevada, and the deposits are now being mined or developed for early production. Tonnage samples of manganese ores were procured from 130 selected deposits for metallurgical and beneficiation tests at the Bureau's laboratories. Progress was made in research work having practical application to mine operation that will aid in conserving mineral resources and promote safety. Research specialists were called into

THREE STAGES OF THE BUREAU OF MINES STRATEGIC-MINERALS INVESTIGATION—EXAMINATION, EXPLORATION, AND METALLURGY

- a, Examining outcrop of chromite deposit. b, Drilling mercury deposit with rotary buckets. c, Preparing samples of manganese ore for metallurgical tests.

consultation from time to time by defense agencies and branches of the Army and Navy.

Two bulletins, 8 reports of investigations, and 12 information circulars covering the Mining Division investigations were published during the year, and 4 additional reports were completed and sent to press.

Examination of strategic-mineral deposits.—The 500 deposits examined during the year were rated according to probable importance and indexed for ready reference. Up to June 1, 1941, exploratory operations on 32 of these deposits comprised taking 16,189 samples for analysis, 76,500 feet of diamond drilling, 5,101 feet of churn and rotary-bucket drilling, 43,809 feet of trenches with removal of 35,387 cubic yards of rock and soil, 2,502 feet of tunnels, 8,126 feet of shafts, and construction of 8.7 miles of truck trails and 6.6 miles of pack trails. Four other operations were started during June. Two of the exploratory projects were on antimony deposits, 5 on chromite, 19 on manganese, 3 on mercury, 2 on nickel, and 5 on tungsten. Six thousand seven hundred and seventy-five tons of manganese ores were mined and delivered for feed to Bureau-operated pilot plants.

Metal mining and milling methods.—Investigations continued in nine Western States.

Mineral-industries survey.—Field engineers traveling in the Western States continued to render technical assistance to prospectors and small-scale mine operators in the solution of their exploration, development, and mining problems. A detailed mineral survey was made of one county in California.

Metal-mining research.—Apparatus devised and built for measuring pressures on rock walls and supports in mines were improved, simplified, and taken into a number of mines, where data were obtained that further encourage the hope of being able to foretell and guard against collapse of pillars and rock bursts. At one mine it was determined that large masses of loose ground can be detected readily by electrosonic methods. Successful outcome of this research will contribute importantly to safety in mining and to conservation by enabling more complete extraction of ores and coal from mines.

In the mine-scale laboratory at Mount Weather, Va., studies of the effect of various kinds and modes of stemming upon the production of noxious gases and dust and upon the efficiency of blasting operations added valuable data for use in eliminating health hazards in mining. Investigations of wetting agents for reducing dustiness in mines were begun, and experiments with alloy drill steels resulted in finding a cheap alloy steel that has a 50-percent longer life than standard carbon steel.

Nonmetal mining.—Rock-loading, haulage, and drilling practices were investigated in 8 quarries, making a total of 21 quarries studied

to date. Crushing and screening tests in 6 quarries developed valuable new data. Research on effects of earth vibrations caused by blasting in quarries was completed and definitely proved the improbability of damage to structures at ordinary distances from quarries. Apparatus for measuring air vibrations, which has applications in defense work as well as in mining operations, was designed and built.

Coal mining.—Investigations of various phases of coal mining, such as underground transportation, multiple-shift mining, power consumption of various machines in actual operation, decay of mine timbers, roof control, and subsidence, developed valuable data that should result in improved methods and thereby promote safety and greater recovery of coal.

Mine ventilation.—Fan-pipe ventilation tests were continued at Mount Weather and supplied data that not only will be of value in mining but will have a broad application to problems of smoke and gas discharge from stacks. An open-jet wind tunnel 8 feet in diameter and 30 feet in length was designed and built for determining jet and wind effects in dilution of gases issuing from stacks. This work was conducted by a recognized authority on highly technical ventilating problems, who was frequently consulted by manufacturers, mine operators, and others.

Electricity and machinery.—Tests of electrical equipment to determine its safety for use in gassy mines when properly installed and maintained led to official approval of 33 different machines and types of apparatus. Inspections and explosion tests were made for the Navy Department on 22 designs of electrical equipment for use on shipboard. Demonstrations of means by which faulty electrical equipment and wiring may ignite gas-air mixtures were made before 450 persons.

Principal Mineralogist

As a contribution to the search for new sources of domestic minerals, more than 5,000 specimens from various sections of the United States were examined, and information was supplied to numerous individuals and organizations. In cooperation with the New England Council, a survey was made of the mineral resources of New England, particularly the strategic and critical minerals in that section of the country. A paper on the spodumene deposits of North Carolina was published.

Metallurgical Division

In addition to normal work and that pertaining to strategic minerals, the Metallurgical Division carried on major investigations in the development of processes for the treatment of low-grade domestic manganese ores that heretofore have failed to yield products suitable

for the preparation of ferromanganese, an alloy essential to every ton of steel produced. These investigations are particularly important at this time because of their part in making this country self-sufficient if stock-piled manganese ore becomes exhausted and foreign shipments of ferro-grade ore are cut off. The results indicate that there is a good probability of accomplishing this objective and at the same time promoting conservation by making possible the use of material normally useless—that is, the large deposits of low-grade ore.

The investigations included laboratory studies in ore dressing, hydrometallurgy, electrometallurgy, and pyrometallurgy. Plans have been formulated and construction is well-advanced on pilot plants to study intensively and determine the commercial aspects of processes found promising in the laboratory when these are applied to ores from deposits containing large reserves of manganese. The ore-dressing work showed that some ferro-grade manganese concentrates could be produced from 48 of the 60 western ores investigated, with a recovery of 20 to 95 percent of the manganese present in the ore. However, only about 40 of these may be classed as amenable to concentration from a commercial standpoint, and the recovery of their manganese averages 75 percent. Each ore presented a distinct problem, and almost every known method of beneficiation was used in the work. Eastern manganese ores have been the subject of similar studies, and many were found to respond to beneficiation. The pyrometallurgical studies demonstrated that the manganese in domestic ores can be smelted with copper or iron sulfides to a manganese matte, which can be refined and sintered to a 60-percent manganese product with a recovery of 90 percent, and that manganese oxide and carbonate fines can be sintered successfully. The hydrometallurgical investigations proved that ores unfavorable for concentration may be treated by one or more hydrometallurgical processes to give products well-adapted to use in the steel industry either as metallic manganese or as a ferro-grade sinter. The processes include the nitrogen peroxide method for oxide and carbonate ores, the sulfuric acid-sulfurous acid percolation leach and the acid-sulfate roast for oxidized ores, the ammonium sulfate roast for carbonate ores, and the reducing roast followed by dilute-acid leach. The manganese may be recovered as a pure metal by electrolysis or as a high-grade sinter by evaporation or precipitation followed by sintering.

Manganese ore dressing.—As virtually no manganese ores of ferro grade exist in the United States, it is important that the possibility of making ferro-grade manganese ore by beneficiating the lower-grade domestic ores be determined.

Approximately 100 lots of manganese ores (usually 2 tons each) have been received at Salt Lake City from properties in Utah, Nevada, Arizona, California, Idaho, and Montana for use in this program.

About 60 of the ores have already been investigated in the ore-dressing laboratory, and it has been found possible to obtain some ferro-grade manganese from about 4 of every 5 ores studied. The recoveries of manganese as ferro-grade material have ranged from less than 20 to more than 95 percent. For the ores classed as amenable to concentration, representing about two-thirds of the total number, the average recovery of manganese was approximately 75 percent. Data have also been obtained showing the higher recoveries obtainable at intermediate stages of concentration. Considerable research has been required to find ore-dressing methods applicable to manganese ores and to develop little-known processes, such as the flotation of silica by means of cationic reagents. As a result of this project, large known reserves of manganese ore in the following western districts have been found amenable to concentration: Las Vegas Wash, Nev.; Battle Mountain, Nev.; Artillery Peak, Ariz.; Drum Mountain, Utah; and Philipsburg, Mont.

Approximately 400 tons of manganese samples were received from the principal eastern manganese deposits, including the Cuyuna range of Minnesota, the Chamberlain district of South Dakota, the Batesville district of Arkansas, the Cartersville district of Georgia, the Little Florida district of New Mexico, and the Leadville district of Colorado. Scattered deposits in Tennessee, Virginia, and North Carolina were also sources of samples. The black ores of the Cuyuna range of Minnesota respond well to beneficiation and produce ferro-manganese-grade concentrates. Ferromanganese-grade concentrates were obtained also from samples of Arkansas, Georgia, and New Mexico ores. The high phosphorus of Arkansas and Georgia deposits is a limiting factor in concentrating to ferromanganese-grade specifications.

A 500-ton-a-day pilot plant, based upon the results of experimental work, is under construction at Chamberlain, S. Dak., for recovering the manganese-bearing nodules in shale. The ore will be mined from pits by power shovels. The concentrating process will comprise crushing, partial drying (causing decrepitation of the shale), and then screening to recover the nodules.

Manganese pyrometallurgy.—Laboratory work done at Salt Lake City has shown that the manganese in low-grade domestic ores can be smelted with copper or iron sulfides to a manganese matte, which can be refined and sintered to a 60-percent manganese product. Recovery of the manganese ranges from 80 to 90 percent. The ores of Chamberlain, S. Dak., and Batesville, Ark., contain excessive amounts of phosphorus, which are satisfactorily removed from the manganese by sulfide smelting. Laboratory investigations indicate that a controlled reducing atmosphere in an electric furnace is desirable for the sulfide smelting of manganese ores. High-grade manganese oxide and

manganese carbonate fines (minus-100-mesh) have been sintered successfully in the laboratory. In some instances sintering is believed to be more economical than nodulizing, if smelting of sinter as compared with smelting of nodules is taken into account.

Manganese hydrometallurgy.—The work in hydrometallurgy has been confined largely to studies of the leaching of those domestic manganese ores of known large reserves that did not respond effectively to ore-dressing treatment. Well-known processes were tested, and new procedures that appear to have outstanding characteristics were developed. The nitrogen peroxide process, the acid- and alkaline-sulfate roasts, the sulfuric acid-sulfurous acid percolation leach, and the acid leach of reduced ore were carried through to the pilot-plant stage, and the Bradley process and the Reyerson modification of the sulfur dioxide-treatment method were investigated. The nitrogen peroxide process is completely regenerative and with suitable modifications may be used on either manganese oxide or carbonate ores. Outstanding features are high recovery of reagent, high concentration of pregnant solution (which reduces evaporation to a minimum), high extraction, and high purity of product. The sulfate roasts are capable of good extraction of manganese and high recovery of reagents and can be adapted to oxide and carbonate ores also. The percolation-leach procedure, although restricted to certain ores, requires heat for evaporation and regeneration of reagents only. The process employing acid leach of reduced ore has been used commercially in conjunction with the manufacture of electrolytic manganese.

Manganese hydrometallurgical pilot plant.—Laboratory investigations have indicated that several processes offer possibilities that are technically and economically sound for beneficiating many low-grade domestic ores to produce a suitable high-grade product. The pilot plant, now rapidly approaching completion at Boulder City, Nev., will be operated on a semicommercial scale to obtain data on consumption of reagents and fuel, extractions on various ores, and types of equipment best-suited to the various processes developed in this laboratory. Other economic and engineering data essential to the design of commercial production plants will also be determined. From such pertinent data the design and construction of commercial-size plants may proceed with reasonable assurance that deficiencies of imports may be offset by domestic production before any actual shortage occurs.

The hydrometallurgical pilot plant will operate (1) to provide required solutions for electrolytic production of metallic manganese and (2) to recover high-grade oxide suitable for ferromanganese production by leaching manganese from low-grade ores. The initial equipment will consist of a ball mill for fine grinding, a muffle-type

roasting and reduction furnace, mechanically operated spray leaching units, cylindrical leaching tanks with various types of agitators, purification tanks, thickeners (both settling and filtration types), belt and centrifugal-drum filters, and plate and frame pressure filters. A spray evaporator, flash evaporator, and multitube decomposition furnace will be provided for subsequent handling of pregnant solutions. A rotary kiln will be used for nodulization of mill concentrates as well as manganese oxide from hydrometallurgical operations.

Manganese electrolytic pilot plant.—This plant was designed as an important supplement to the hydrometallurgical plant and has been integrated with the whole pilot-plant set-up. Part of the material from the ore-dressing section, after leaching by the hydrometallurgical section, will be treated for the production of electrolytic manganese of high purity. One hundred cell runs have been made, and all necessary preliminary investigational work has been finished, so that the plant will be put in operation as soon as completed to obtain data upon which reliable cost estimates may be based.

Manganese ore-dressing pilot plant.—The construction of the ore-dressing pilot plant at Boulder City, Nev., is nearing completion. This plant, using commercial equipment, will serve as a means of investigating and proving on a large scale ore-dressing processes developed in the laboratory at Salt Lake City for concentrating western manganese ores. It comprises a dry-crushing plant, ore-conveying system, the mill proper, concentrate-drying equipment, and a general dust-collecting system. The mill proper is designed to afford the maximum flexibility required in pilot-plant operation on ores of greatly varying grade and character.

Metallurgical fundamentals.—At the Pacific Experiment Station, Berkeley, Calif., specializing in the determination of energy relationships of metallurgical substances or reactions, publications were prepared dealing with sponge chromium, specific heats at low temperatures and entropies of inorganic substances, and thermodynamic properties of gypsum and its dehydration products, and a number of articles concerning individual oxides and carbides were published in technical journals. Defense activities consisted of experimental study of the thermodynamic properties of compounds of chromium and manganese important to processes being tested by other units of the division. Equipment has been improved to facilitate consistently productive utilization for thermodynamic measurements, and new equipment has been devised for rapid precision measurement of high-temperature specific heats. Experimental determinations of low-temperature specific heats and entropies of typical silicates important in smelting have been completed, as have detailed investigations of the thermal properties of boron trioxide and the carbides of boron, silicon, and calcium. Because of its previous pioneer work in the field of

natural-gas reduction of iron ores, the section received many requests for advice in the development of a number of projects utilizing these methods. At least one of these projects has reached commercial production.

Ferrous metallurgy.—Two new methods of determining carbon were made practical, and instruments based upon them were exhibited at the convention of the American Society for Testing Materials held in Chicago in June. Apparatus capable of distinguishing between metals of slightly different composition was also shown. This operated upon the basis of differences in thermoelectric power, and the demonstration of its use consisted in the rapid separation of plain carbon-steel sheets from material differing in composition only by the presence of about 0.22 percent copper. A rather brief investigation of the A_3 point in iron revealed some unusually interesting scientific results. An investigation of a new method of analyzing for metallic iron in the presence of oxides and slags was completed.

Nonferrous metallurgy.—General practice in lead smelting has been to add barren materials to flotation concentrates to make a porous bed. It has been found that this can be avoided by making the concentrates into pellets. The use of these on the Scotch hearth overcomes the various difficulties encountered when the finely divided concentrates were tried. Investigations on the electrothermic reduction of magnesite to metallic magnesium have been carried out on a fair scale, and about 100 pounds of metal has been made. Several thousand mineral samples were identified as a result of increased public interest in prospecting for strategic minerals. The program under which representative ore samples from various regions are tested to determine the best method for treatment continues to be an effective means for conservation through improved mineral recovery. In all, 34,786 analyses and tests were completed in carrying on the Bureau's search for strategic-mineral reserves. Extensive studies on electrolytic manganese have shown that it can be used instead of ferromanganese in the manufacture of steel, but at greater cost, and that many alloys with unique and useful properties can be made with this very pure metal. One type has been found useful in reducing the noise of gears and other moving mechanisms, another possesses the property of zero temperature-coefficient of resistance, and a third type has an unusually high coefficient of thermal expansion which, when combined in a bimetallic strip, makes a very satisfactory material for instrument control.

Electrometallurgy.—An electrolytic method for recovery of high-grade chromium metal from domestic ores has been developed. The electric energy consumed is less than half the power required for chromium deposition by the usual electrodeposition processes. A promising method, which involves pyro- and hydro-metallurgical

treatment, is under development for the production of standard-grade ferrochrome from substandard domestic ores. Pilot operation on a small scale is in progress on both methods. A satisfactory procedure has been developed for recovering cobalt electrolytically from complex domestic ores, and small-scale pilot operation has recovered several hundred pounds of electrolytic metal as a practical demonstration of the applicability of the process. Excellent progress has been made in the preparation of metallic boron from boron minerals occurring in the southwestern region of the United States. Various intermediate boron products, such as calcium and magnesium borides, boric acid, and calcium borate, have been produced during the course of the work.

Dust settling.—Work on precipitation of smoke by high-frequency sound has progressed from the laboratory stage to the construction of the first practical-size unit at Salt Lake City. Further experimental work is being continued with the larger unit.

Ore dressing.—As a result of ore-dressing studies, the following ores were found amenable to concentration: Alunite from Marysvale, Utah, by attrition grinding or flotation; chromite from Montana by tabling or flotation, using cationic reagents; chromite from California by tabling; magnesite from Washington by flotation of silica, using cationic reagents; stibnite from Yellow Pine, Idaho, by flotation; and scheelite from Utah by tabling. Laboratory studies and pilot-plant tests were instrumental in establishing improved plant practice in crushing low-grade zinc ores, in the use of cationic reagents in the flotation of silica and discoloring impurities from gypsum ores, in the flotation of mercury ore, and in the concentration of vanadium ore. A method was developed by which high-grade Texas magnesite could be distinguished from low-grade ore.

Petroleum and Natural-Gas Division

The international importance of petroleum and its products, even to the extent of controlling a nation's destiny, has prompted a reappraisal of each technical problem in the Petroleum and Natural-Gas Division to determine its direct bearing on (1) availability and conservation of petroleum needed in a national emergency, (2) production, manufacture, and use without waste, and (3) means of safeguarding physical equipment used by all branches of the industry. Long-time research judged to be of secondary importance in the present emergency was suspended, and each active study was oriented to advance in step with rapidly changing conditions.

At the request of the Advisory Commission to the Council of National Defense, the combined efforts of the refinery group have been

turned to a survey of the quantity and geographic distribution of crude oils suitable for the manufacture of aviation gasoline. Approximately 250 samples were taken from selected oil fields of the United States and analyzed in the laboratories of the Petroleum Experiment Station at Bartlesville, Okla. The survey, now virtually complete, has shown that a number of oil fields heretofore not producers of such crude oil are potential sources of aviation gasoline. At the same time a study was also made of the location, capacity, and type of existing refineries in relation to national-defense requirements for manufactured petroleum products.

A large fund of information on fire and accident prevention in oil fields and at natural-gasoline plants and refineries, supported by experimental data on the explosibility of mixtures of air and petroleum vapors, was supplied to defense agencies. Early in the year, observations were started on evaporation losses, during storage in large tanks, from hydrocarbon liquids that can be blended to make aviation gasoline. A careful check was made of transportation facilities in the Rocky Mountain region, and earlier maps by various cartographers were corrected.

Chemistry and refining of petroleum.—Research on asphalts, conducted at the Petroleum Experiment Station, Laramie, Wyo., has an important bearing on the construction of military highways and airport runways. The work shows that the black oils of the Rocky Mountains are suitable for the manufacture of asphalts and that the product is similar to that obtained from crude oils of California, Mexico, and Arkansas. Work on high-sulfur crude oils demonstrated that treatment of light distillates with liquid sulfur dioxide will lower the sulfur content to give products that are important in relation to conservation of petroleum supplies. Current semiannual reports of the survey of motor gasoline, made periodically since 1915, proved especially valuable in defense planning because they give a cross-section of the characteristics of present-day motor fuels available throughout the country for motorized equipment.

Production of petroleum and natural gas.—The efforts of the production group were focused on more accurate estimates of the availability of oil and gas at rates of withdrawal commensurate with good conservation practices. Studies of the relation between decline in reservoir pressure and cumulative production of oil give promise of a new tool to help in analyzing reservoir performance. Graphs and equations for similar purposes were developed from a study of rock permeability, water saturation, pressure traverses in reservoirs, and rates of flow of oil and gas through producing formations. Data on many reservoirs were assembled in the further study of the effect of well spacing on ultimate recovery, and field tests were made with the Bureau of Mines-American Petroleum Institute pressure core barrel.

A report on methods of cleaning wells to increase their productivity is being prepared for publication.

Studies pertaining to deep formations in Gulf Coast fields that contain condensable hydrocarbon vapors under high pressure revealed important new information about reservoir conditions. This information can be applied to production methods that will best conserve available reservoir energy and lead to maximum recovery. Information on gas-oil ratios, solubility, and gas- and liquid-phase behavior assists in planning cycling operations to maintain the energy requirements of reservoir systems. Further attention was given to the function of water as an aid to maximum oil recovery. Laboratory data now at hand on rates of travel of oil and water through porous rocks indicate that there is an optimum rate of water advance which, if exceeded, will not increase materially the quantity of extractable oil.

A bulletin was published giving the history and production of oil and gas fields of Wyoming. This should be an advantageous current reference for use in estimating the petroleum reserves in the State and their availability for national defense. A report presenting results of a detailed study of the Anahuac field, Texas, shows the benefits to be derived from operations in strict conformance with scientific and engineering principles. A preliminary report was prepared on conditions in the Rodessa field in Louisiana, Texas, and Arkansas. A paper was published on a simple hydrometer method for determining particle-size distribution and colloidal content of drilling muds. Specific examples of heaving-shale conditions studied by the Bureau direct attention to difficulties in drilling some Gulf Coast fields, the remedies applied, and the results obtained. Experiments on water-saturated cores of sedimentary rocks, subjected to a maximum hydrostatic pressure of 8,000 pounds per square inch, caused Bureau engineers to deduce that the compressibility of oil-bearing rocks probably is not great enough to influence appreciably the estimates of reservoir content and ultimate recovery.

Natural gas.—Continuing cooperative research with the American Gas Association on the composition and formation of gas hydrates—icelike substances that cause plugging of natural-gas pipe lines at temperatures considerably above the freezing point of water—emphasized the importance of knowing whether the gas is saturated with water. It was found that the water content of the gas at pressures up to 600 pounds per square inch can be appreciably greater than the values calculated from vapor-pressure data by use of the common gas laws. Upon the basis of this information, the natural-gas industry will be able to operate its lines more effectively with fewer disruptions to service caused by freezing. A comprehensive study was made, also in cooperation with the American Gas Association, of the gas- and liquid-phase relations of a sample of hydrocarbon material

from a high-pressure well in the Cayuga (Tex.) field. It is believed that these tests have shown for the first time the maximum pressure at which a mixture of separator gas and liquid in any proportion could exist in the two phases. This information is of practical importance in the operation of fields of the condensate type at pressures high enough to prevent liquefaction and irrevocable loss of products in the formations.

Oil-field brines.—Cooperative work in Oklahoma and Kansas continued on oil-field brine-disposal methods. Particular attention was given to the advantageous use of treated brine as an injection medium in artificial water flooding.

Helium production.—The Amarillo helium plant produced over 16,250,000 cubic feet of helium during the fiscal year 1941, or about 72 percent more than in 1940. This is the greatest quantity ever produced by the plant in any one year. Approximately 93 percent of the output was supplied to the Government, and the other 7 percent was sold for medical, scientific, and commercial uses. The Weather Bureau's use of helium in meteorological balloons has increased because of military demands for weather information at points outside continental United States. Also, the military requirements have been increased greatly for training men in barrage-balloon operations and for operating airships and varied uses in the fleet. The Bureau of Mines Helium Plant at Amarillo has produced 116,244,000 cubic feet of helium in the 12 years since it was completed, even though the demand has permitted intermittent operation only and the plant actually has been producing less than half of the time. The Army and Navy have advised the Bureau that greater quantities of helium will be needed for national defense, and preparations are being made to drill more gas wells and to increase plant capacity to meet military needs.

Nonmetals Division

The essential efforts of the Nonmetals Division are now directed to those aspects of its problems that deal with defense or, in a few instances, with the probable after effects of defense. Projects recommended by the Office of Production Management and other Federal agencies have been undertaken. These are concerned with the production or preparation of such materials as bauxite, graphite, iron, clays, and high-temperature refractories. The studies of the cracking of boiler steel also have assumed special importance with regard to safeguarding the production of electric power and transportation on our railroads.

Possible substitutes for imported materials have been found in the cases of graphite, special clays, mica, bauxite and kyanite. Methods have been developed for improving the quality of iron ore and so

increasing output of iron. A satisfactory activated carbon has been made from coal.

Graphite.—The shortage of graphite of the type imported from Madagascar, with large, thick flakes, so essential for crucibles in the manufacture of special tool steels, led to flotation studies of Alabama graphite and the development of a procedure whereby a usable, although thin-flaked, substitute for part of the imported material could be obtained. A paper is now being issued through the Alabama State Geological Survey, which cooperated in this work, to describe this process.

Activated carbon from coal.—Activated carbon is used extensively in water-purification plants for the removal of tastes and odors. Methods were developed on a laboratory scale for production of activated carbon from coal. The activity of the product compares favorably with commercial grades of activated carbon made from the ordinary raw materials. A modified activation procedure was found to produce a material that may prove valuable for softening water.

Forsterite.—Large supplies of high-temperature refractories are especially important in the production of steel and other metals. Experiments at the Bureau's electrotechnical laboratory at Norris, Tenn., showed that the fusion of olivine dunite, an igneous rock plentiful in the Appalachian mountain system, will give a product called forsterite, which has a very high melting point and is capable of being cast into shapes like brick for replacement of refractories made from imported magnesite.

Clay.—The widely ramified clay industries call for many different types of raw material. Investigations are in progress to find domestic clays that are substitutes for imported varieties or that can be treated to yield suitable substitutes. The application of froth flotation, a new tool in clay treatment, has been successful not only in removing objectionable micaceous minerals but at the same time in recovering mica that is marketable. The work of the Norris (Tenn.) station in the development of an "all-American" chinaware body is meeting with success, and a number of publications have been issued on the material that has been developed. Domestic clay deposits have been found that can be used for thickening enamelers' slips for vitreous enamel coating of sheet metal. A deposit of white montmorillonite in Texas is the latest discovery suitable for this purpose. The rapid progress of these clay investigations gives promise that the United States ultimately can be independent of foreign supplies.

Bauxite.—The low-grade bauxites of Arkansas have not been considered commercially suitable for production of aluminum, but recent research on flotation treatment of siliceous ores at the Southern Experiment Station indicates that many of the low-grade ores can be concentrated to an acceptable grade, thus greatly increasing domestic

bauxite reserves. Deposits of bauxite from other States are also being tested as rapidly as possible.

Kyanite.—The United States has large amounts of various kinds of kyanite, but one type is still being imported from India. Indian kyanite, used in making superrefractory brick, nozzles, and other refractory shapes, is almost indispensable in some of the defense production. It can be calcined to a strong grain, whereas American kyanite calcines to a weak, chalky grain. Research in cooperation with a group of producers and users on converting American kyanite to strong, coarse grains has given some very promising results.

Iron ore.—The huge demand for iron and steel makes it important to put only the highest-grade materials through the furnaces in order to get the maximum output. Ores from the Birmingham district are lower grade than those from the north because they were deposited as coatings on sand grains. The Southern Experiment Station has devised a process of gentle crumbling or scuffing to rub off the soft iron ore from the sand grains. This is done in a tube mill with ore crushed to the right size so that by its own weight it rubs off the iron oxides without crushing the sand. One large steel company has built and is operating a plant for the preparation of ore in this manner. As soon as the details of the commercial development have been worked out, a number of other steel companies in the district plan to build similar plants, which will increase output and decrease costs in the Birmingham district.

Embrittlement of boiler steel.—Stationary and locomotive boilers suffer a peculiar type of cracking in their riveted seams, which is called embrittlement. Within the past 6 months, 4 stationary boilers, each generating 150,000 pounds of steam an hour at 500 pounds pressure, have cracked in this manner. Under present conditions replacement of these units will require months. Some of the largest railroads in the United States have had extensive difficulty with this same type of cracking in their newest and most modern locomotives, and the trouble seems to be increasing. The cracking is due to certain dissolved mineral constituents of the boiler water. Investigation by the Bureau has developed a device called the embrittlement detector, which may be attached to a boiler to detect the embrittling nature of the water before any damage is done. About 200 of these test devices are now in plant use. For waters that are dangerous and can cause cracking, methods of adding chemicals to eliminate this characteristic have been worked out. One large eastern railroad has had more than a year's experience with these methods of chemical control, and cracking in the locomotives has been stopped.

Proper application of the results of this work during the present emergency should help to eliminate boiler failures in important manufacturing and transportation industries.

Explosives Division

The Explosives Division contributed service to the Navy Department on problems relating to aircraft carriers; extended its testing-station facilities to the National Defense Research Committee; and gave lectures and demonstrations on the prevention of sabotage by explosives and fire before the Army War College, United States Secret Service, and local police and firemen's organizations. It gave information and advice to other agencies contributing to national defense, such as the Procurement Division of the Treasury Department, Export Control Administration, Tariff Commission, Interstate Commerce Commission, Panama Canal, and Ordnance branches of the Army and Navy. It has taken part in the formulation of legislation to regulate the sale and use of explosives in the national emergency and has rendered aid to State governments attempting such regulation.

Testing of explosives.—Explosives testing is a fundamental service designed to conserve human life and property, and permissible explosives are important in the production of coal—a fuel that is the backbone of our industrial defense effort. To maintain our present standard of safe explosives, and to improve that standard, 1,317 gallery tests were conducted on samples of explosives to determine whether they would ignite gas or dust mixtures such as may develop in a coal mine. In addition, 879 explosives-control tests of a physical nature were made. Five new explosives were submitted for permissibility tests; 4 met the requirements and were placed on the permissible list.

Research on explosives.—Testing and research were continued to ascertain the best means for rendering permissible explosives even more safe by the use of sheaths. Other information relating to safety in permissibles was obtained by exploring the fundamental physical and chemical phenomena that determine the temperatures and pressures set up by explosives, which affect the ignition of gas and dust and the production of poisonous gases. Studies of certain blasting techniques were continued. Particular attention was given cushioned blasting, with special reference to its effect on ignition and the production of poisonous gases. The use of carbonaceous blasting accessories in loading was shown to increase the production of carbon monoxide. In the use of blasting devices actuated by carbon dioxide, certain questions of safety have arisen, concerned chiefly with the possibility of ejection of the device from the hole in a dangerous manner. The methods deemed most suitable for overcoming such hazards are being studied.

As a substitute for fixed explosives (that these may be released for military use), liquid-oxygen explosives present some possibilities, particularly in demolitions and in certain open-pit mining operations. Strikingly effective improvement in such explosives has been made

recently by the Explosives Division, consisting in the substantial elimination of accidental inflammation by fire or spark. The success of this fire-retardant treatment has led to the initiation of other studies on liquid-oxygen explosives in cooperation with industry.

Gas explosions.—In the conservation of life and property by the minimization of gas-explosion hazards, notable advances have been made in the administration of gaseous anesthetic agents. Studies in cooperation with the University of Pittsburgh and the St. Francis Hospital, Pittsburgh, have developed techniques that make the administration of oxygen in mixture with gaseous combustibles, such as cyclopropane, substantially free from hazard. Helium is used as a nonexplosive diluent to bring the mixture into the noninflammable range. Studies of the inflammable and explosive properties of combustible vapors in mixture with air were extended to some of those encountered in the manufacture of synthetic rubber, a product potentially essential to national defense.

Hazards in the use of Diesel mine locomotives.—The Diesel engine, unlike other internal-combustion engines at present widely employed, may be operated with an exhaust containing very little toxic gas. This engine may offer peculiar advantages in mining and manufacturing operations where confined quarters and combustible vapors present difficult problems. Important data on such effects have already been obtained. The study of the toxicity of Diesel exhaust gases and the ignition hazards in explosive atmospheres is continuing, and a number of valuable contributions to fundamental knowledge have been made. An experimental gallery large enough to permit testing an assembled mine locomotive has been designed and soon will be ready for service.

Investigation of explosions.—The specialized information and experience available in the Explosives Division have been sought in connection with a number of disasters involving questions of national defense. Assistance has been given during the fiscal year in investigations of explosions at several explosives plants.

Economics and Statistics Branch

The Economics and Statistics Branch includes the Coal Economics, Petroleum Economics, Mineral Production and Economics, Metal Economics, Nonmetal Economics, and Foreign Minerals Divisions. Its normal activities comprise the collection, interpretation, and publication of data on all mineral commodities; research on special economic subjects; and compilation of the annual statistical report, Minerals Yearbook. The World War of 1914–18 caused an enormous increase in mineral production because mineral fuels, metals, and non-metals are vital in warfare. Hence, it is not surprising that all of the

activities of the branch, which is the Government's chief agency in the field of mineral economics and statistics, acquired added significance during the past year of preparedness for national defense, as defense officials turned to it for data on mineral production, consumption, and stocks needed to plan an intelligent defense program and for the counsel and guidance of the Bureau's impartial commodity specialists.

Office of chief of branch.—As secretary of the Minerals Advisory Committee to the Army and Navy Munitions Board and member of the Interdepartmental Committee on Strategic Materials, the Interdepartmental Committee on Policy for Export Control, and the Army and Navy Munitions Board Committee on Strategic Materials, Specifications, and Storage, and in directing the activities of the branch, the chief of branch was almost wholly occupied with defense problems during the past year.

Coal Economics Division

The economics and statistical service relating to developments in the solid-mineral-fuel industries was expanded during the year to meet the needs of Federal defense agencies.

Special reports.—At the request of the Advisory Commission to the Council of National Defense a survey of the coke-producing capacity of the country was inaugurated early in 1941, and the results were reported to the Office of Production Management at the end of February. Owing to continued rehabilitation of old beehive coke ovens, the canvass of existing capacity was continued, and a report on total coke-producing capacity was published in June 1941. At the request of the Advisory Commission, a special study was made regarding the destination of coke shipped in 1940, by principal uses. In addition, the monthly coke report was expanded to include data showing production and stocks of toluol, naphthalene, tar, and creosote oil and stocks of ammonia and benzol. Numerous requests from defense agencies for specific information, chiefly regarding coke and byproducts, were answered from time to time throughout the year.

Annual reports.—Annual reviews based upon reports from individual producers covering developments in the Pennsylvania anthracite industry and the lignite, byproduct- and beehive-coke, fuel-briquet, packaged-fuel, and peat industries were prepared for publication in Minerals Yearbook. Developments and changes within the anthracite industry necessitated close contact with the Pennsylvania Department of Mines, the Anthracite Emergency Committee, and the Anthracite Institute. The expansion of the illicit coal trade, the large increase in anthracite shipments by truck, and the

operation of the program of the Anthracite Emergency Committee were special developments. The great demand for coke for metallurgical fuel was the outstanding feature of the year in the coke industry, resulting in a new high record of byproduct-coke production and a record of total coke production second only to that of 1929. A noteworthy result of the exceptional demand for coke was the reuse of many existing beehive ovens previously abandoned, the rehabilitation of old ovens, and the large increase in the number of active ovens. New byproduct ovens were rebuilt or enlarged and old ones restored, resulting in an increase of scheduled capacity for 1941 estimated at nearly 3,000,000 tons.

Monthly reports.—Preliminary data on the production of anthracite and beehive coke and reports on production and stocks of coke and byproducts and on international coal trade were issued monthly. Preliminary statistics of the annual production of coke and byproducts in 1940 were published in January 1941 as a supplement to the monthly coke report, and a similar supplement covering the final annual figures of production of coke and byproducts was published in May. Likewise, preliminary data on the annual production of Pennsylvania anthracite in 1940 were published in January 1941, and the final annual figures were published in June. The preliminary estimates of production of Pennsylvania anthracite and of coke and byproducts provide industry and public with these data at the earliest possible time, and the later preliminary publication of final annual figures serves a similar purpose until the more complete data and analyses are available in separate chapters of Minerals Yearbook.

Weekly reports.—A weekly report furnished current information regarding the production of anthracite and of beehive coke, and once each month this report summarized the information available regarding developments in the Pennsylvania anthracite industry.

Correspondence and inquiries.—The service supplied in response to numerous inquiries by mail, telephone, and personal visit was an important phase of the division's work, as it provided direct contacts with the industries and the public served. It also gave a valuable indication of the needs of the public and the solid-fuel industries for results of the division's work.

Petroleum Economics Division

The Petroleum Economics Division collected statistics and economic data that represented a comprehensive coverage of operations for the petroleum and natural-gas industries. These data were published as weekly, monthly, and annual reports and were supplemented by compilations of information for Federal and State agencies. Because petroleum and its products are vital in so many branches of

defense activity, all reports prepared by the division are pertinent to the defense program.

Special defense work.—The work of the division was adapted and expanded to meet the special requirements of the various agencies dealing with defense problems. The special monthly survey of aviation gasoline, inaugurated in October 1939 to cover production, stocks, and domestic demands, was revised and enlarged and supplemented by special capacity studies. Regular and special reports dealing with world production, international trade, and world consumption were supplied to virtually every Government agency dealing with the foreign situation. The annual list of petroleum refineries, showing changes in location and capacity, was compiled in record time and released in April 1941. At the close of the year the division was making a survey of oil pipe lines to determine mileage and capacity, with particular reference to interstate lines.

Forecasts of demand.—The regular monthly forecasts of the demand for motor fuel and crude petroleum by States of origin proved of particular value in view of the sharp readjustments resulting from the rising domestic demand to meet defense requirements and the rapid shifts in import and export movements. These forecasts are of outstanding interest to State conservation agencies in connection with proration programs to avoid waste and prevent the uneconomic accumulation of oil in storage. At the request of the Interstate Oil Compact Commission, the Bureau has supplemented its monthly forecasts with reviews of the longer-term trends in demand. Special forecasts and compilations of supply and demand data were undertaken as the result of an impending shortage of oil supplies in the Atlantic coast area owing to tanker withdrawals.

Field offices.—The division maintained a field office at Los Angeles for collection of California data and another at Bartlesville, Okla., for contact with State agencies and for assembly of information on natural gas.

Mineral Production and Economics Division

The Mineral Production and Economics Division continued to collect mine-production statistics for gold, silver, copper, lead, and zinc in the United States; supervised the preparation of the annual volume, *Minerals Yearbook*; and assembled and interpreted statistics on employment, accidents, and explosives as related to the mining industries.

National defense.—Because of heavy demands from defense agencies of the Federal Government for information concerning essential war minerals, the division inaugurated monthly and quarterly canvasses of copper, lead, and zinc mine production. Shortages of zinc necessitated

a survey of domestic mines to determine production potentials; a forecast of output for 1941 was made in January. The staffs of the western offices of the division were increased for these purposes and to handle the increasing number of requests for information stimulated by expansion of mining in the West. The usual preliminary reviews of nonferrous metal mining in 13 Western States in 1941 were released early in January 1941, and summaries of mine production of gold, silver, copper, lead, and zinc were distributed before the close of January 1941. The final detailed nonferrous-metal statistics for the 13 Western States were completed by the middle of June.

Minerals Yearbook.—The printing of *Minerals Yearbook*, Review of 1939, was delayed several months, in consequence of which the volume was not issued until December 1940. Nevertheless, the sales edition was exhausted in a short time, as usual. Through the cooperation of the Public Printer, a much earlier publication date has been arranged for the current *Minerals Yearbook* and prompt release of all chapters as preprints. By the close of June 1941, 39 chapters had been issued, as compared with 14 on June 30, 1940.

Census of mines and quarries.—The chief of the division was loaned to the Bureau of the Census to direct the Sixteenth Census of Mines and Quarries. The personnel of the division in Washington and in the field, as well as the commodity specialists, statisticians, and data files of the entire branch, were used extensively in conducting the census.

Employment and accidents.—As a basis for studying the causes of accidents and to provide a measure of progress in the promotion of safety, the annual surveys of employment and accidents at all mines, quarries, mills, smelters, and coke ovens in the United States were continued. Final statistics covering these industries for the calendar year 1939 and preliminary figures for 1940 were published. Accident-prevention contests were conducted, and safety trophies were awarded to mines and quarries that established the best safety records. A special survey of bituminous-coal mines was made to determine the number and proportionate distribution of coal-mine workers, by occupational groups. Information was collected as usual from manufacturers of explosives to determine the quantity of explosives manufactured and sold in the United States and the quantity used in the mining, quarrying, and other industries. Statistical information regarding explosives and other subjects was supplied to military and civil defense agencies.

Metal Economics Division

The demand for minerals for national defense during the past year was focused chiefly on metals. Aluminum and magnesium for air-

planes, iron and steel for tanks and ships, copper and zinc for brass going into ammunition, manganese, chromium, and tungsten for tools and high-strength alloys, tin for many essential uses, and virtually all other metals were called for in quantities approaching and in most instances exceeding previous peaks. As existing domestic production capacity was unable to meet the demand, emphasis was placed on providing additional capacity and stimulating imports. Despite these efforts, shortages that developed during the latter part of 1940 and in the first half of 1941 necessitated the imposition of priority allocations by the defense agencies. These activities brought numerous requests to the division for additional monthly statistics and special surveys as various problems arose.

Special services for national defense.—As a result of the vital position of metals in the manufacture of munitions, the experienced commodity specialists of the division were constantly called upon to give counsel to the personnel concerned directly with national-defense activities. Monthly surveys of production, consumption, and stocks of manganese ore, chromite, tungsten ore, mercury, and tin and a quarterly canvass of consumption and stocks of iron and steel scrap and pig iron were inaugurated in 1940. These services were continued during the past fiscal year, and many others were added. Special surveys were made of consumption and stocks of aluminum and magnesium, zinc-smelting capacity, estimated mine production of zinc in 1941, estimated copper requirements, mercury and bauxite reserves, fluorspar supplies, iridium stocks, ferro-alloy production capacity, etc. In some instances the urgent need for the data necessitated the use of the telegraph in obtaining them. Monthly canvasses of consumption and stocks of zinc were initiated in September 1940. Many other current statistical reports have been instituted, including quarterly or monthly data on production, consumption, and stocks of antimony, cadmium, cobalt, bauxite, platinum-group metals, ferromanganese, spiegeleisen, silicomanganese, ferrochrome, ferrotungsten, ferrosilicon, and others.

Secondary metals.—The demand for supplies of virgin metal drew attention to the reservoir of secondary metal available for return to melting plants. The secondary-metals section at Pittsburgh expanded its efforts to keep defense agencies informed regarding sources and quantities of available materials. The quarterly surveys of ferrous scrap proved of such value to the defense program that monthly canvasses were inaugurated beginning July 1. Major expansion was also undertaken in the field of secondary nonferrous metals, and to make the results of this work immediately available to defense officials these activities were moved from the Pittsburgh (Pa.) to the College Park (Md.) station of the Bureau. In addition to the expanded annual survey of consumption and stocks of nonferrous scrap,

the section conducted special surveys on the consumption of aluminum, copper, and zinc scrap and also made the first survey of stocks of all types of nonferrous scrap held by suppliers and dealers. Previously data were available only on consumers' stocks.

Other services.—The commodity specialists of the division served as members of numerous committees concerned with defense and other problems. The head of the ferrous-metals section devoted virtually full time as consultant on ferrous raw materials to the Advisory Commission of the Council of National Defense and later to the Office of Production Management, and the head of the non-ferrous-metals section likewise devoted a large part of his time to assisting the defense agencies. Moderate expansion of personnel was necessary to meet demands, but considerable difficulty was experienced in obtaining qualified employees. The data files of the division have been placed at the disposal of the defense agencies. This reservoir of technical and economic information proved of invaluable aid to many concerned with problems of procurement, price, supply, and substitution. The rapid development of domestic deposits resulting from the unprecedented demand for metal caused a heavy increase in the number of requests from members of the Congress, other Government agencies, industry, and the public for information on a wide field of subjects.

Nonmetal Economics Division

The Nonmetallic Economics Division was strengthened to meet the demand from the Government and the public for more statistics and economic data during the present emergency, and a field office was established at Tuscaloosa, Ala., to maintain better contact with the growing production and consumption of industrial minerals in the South.

National defense.—Although well-supplied with most industrial minerals, the United States has depended largely on foreign sources for graphite, special varieties of mica, quartz crystals, industrial diamonds, asbestos, and certain other vitally essential materials. Illustrative of the complexity of industrial-minerals problems is the monthly survey by this division of consumption and stocks of strategic classes of mica, which regularly covers 38 different kinds and sizes; other varieties of mica are abundantly available domestically. As the defense picture broadened, the division was required not only to amplify its statistical and information services in respect to recognized strategic minerals but also to furnish data as to the availability of sand and gravel, traprock, lime, cement, and sundry other materials that are notoriously abundant but not always available at reasonable cost in localities where new construction was contemplated. Information was furnished regarding civilian needs, total consumption,

supplies, and other pertinent data on essential materials that were being considered by the defense agencies in connection with possible export control, price administration, Reconstruction Finance Corporation loans, certificates of necessity, and shipping or other priorities.

Fully one-fourth of the time of the division's commodity specialists was consumed in direct services to national defense agencies and British and Canadian specialists. However, even routine activities felt the stress of national emergency. For many years the division has furnished market information and general advice on nonmetallics to miners, owners of deposits, and prospective investors, and demand for this service was greatly increased. Many inquiries came from persons who sought patriotically to aid the Government in procuring vital raw materials. A series of reports comprehensively reviewing the subject of industrial minerals needed for national defense was supplemented by confidential memoranda to the Office of Production Management and the Army and Navy Munitions Board in respect to impending bottlenecks in several industries. Members of the staff aided in the search for domestic substitutes for clays, grinding pebbles, graphite, quartz crystals, and mica of the kinds normally imported and were active on various interdepartmental committees. The chief of the division was appointed by the National Academy of Sciences and the National Research Council to the Advisory Committee on Metals and Minerals to serve as secretary of the Nonmetallic Minerals Group.

Publications.—In addition to preparing 19 chapters of Minerals Yearbook, reviewing more than 115 groups of nonmetallic minerals and 20 rare metals, the division compiled 194 pages of Mineral Trade Notes, published 12 information circulars, and compiled other manuscripts for later publication covering various commodities and groups of commodities. Four papers presented in public addresses and several articles contributed to trade and economic journals and to professional societies were published by other agencies.

Foreign Minerals Division

The Foreign Minerals Division is charged with collecting and analyzing data on the mineral industries in foreign countries. Because the United States is deficient in several important minerals, such as manganese ore, chromite, tungsten, mica, and tin, factual information on production, consumption, stocks, and flow abroad assumed additional significance during the past year in connection with defense preparations.

National defense.—Official censorship effective during the year in most countries outside the Western Hemisphere caused suspension of the publication of foreign mineral statistics, as well as other pertinent

economic data. However, the division has succeeded in maintaining liaison with many foreign sources of information from which confidential reports have been obtained for the defense agencies, for several of which the division now serves as the intermediary for procurement of such information relating to availability of essential minerals. World canvasses were made during the year of current production, shipments, and stocks of specific mineral products.

Latin American activity.—To facilitate service to agencies directly concerned with the procurement of essential minerals, four mining engineers were assigned to Latin-American countries early in 1941, making a total of five specialists now engaged in that area. These foreign-mineral specialists have been assigned as technical advisors to the American embassies at Rio de Janeiro, Brazil; Buenos Aires, Argentina; Santiago, Chile; and Lima, Peru. At the request of the Office of Production Management, another engineer was detailed to make a survey of strategic-mineral resources in Central America and Mexico. Significant aid has been given by these engineers to the procurement program of this Government, particularly in regard to the purchases of manganese, chromite, antimony, tin, nickel, mercury, tungsten, mica, and other strategic minerals produced in Latin America.

Publications.—Of necessity much of the division's activity was of a confidential nature. However, the usual compilations of foreign mineral-production statistics were made for Minerals Yearbook. In addition, two issues of Foreign Minerals Quarterly were published that covered in detail the mineral industries of Argentina, Uruguay, and Paraguay. Over 2,521 consular reports were received from abroad during the past year and were distributed to interested commodity specialists of the Government.

Health and Safety Branch

The Health and Safety Branch comprises the Health and Safety Divisions. Its main functions include study of health hazards in the mineral industries, safety education and training, and investigation of causes of accidents and mine disasters. All of these contribute directly to the conservation of an important asset for national defense—human life.

Health Division

Increased activity in the mineral industries resulting from our preparedness program has introduced new hazards and emphasized familiar ones. To provide adequate safeguards against these increasing hazards, the Health Division has intensified its efforts to develop adequate control and protective measures. Determinations of atmospheric contaminants in a zinc smelter served as a basis for rec-

ommendations for eliminating or controlling harmful or objectionable conditions, thereby increasing the efficiency and morale of the workers. Respirators were tested and approved, and users were instructed in their use, limitations, and maintenance; reports were prepared on dilution of contaminants from ventilation of underground passageways and on Diesel exhaust gas; and methods for studying atmospheric contaminants were improved.

Investigation of atmospheric environment of workers in a zinc smelter.—The relation between the concentration of the various contaminants of hygienic significance in the breathing zones of employees of a zinc smelter and the maximum concentrations thought to be safe for continuous 8-hour daily exposure was determined. Concentrations exceeding the safe maximum were found in various departments of the smelter, particularly in the pottery, where men were exposed to high concentrations of silica dust during certain operations. Recommendations were made for control of the various harmful conditions found.

Respiratory protection against noxious gases and dusts.—Twelve new approvals and many extensions of former approvals were granted on devices for protecting workers against inhalation of injurious gases and dusts. Assistance was given to manufacturers in the development of improved respirators, and information on the use, limitations, and maintenance of respirators was given to the users to enable them to obtain maximum protection.

Gas analysis.—Approximately 1,500 gas samples were analyzed in connection with studies dealing with efficiency of ventilation in mines and in tunnels under construction, evaluation of hazards from methane and other gaseous contaminants of underground workings, production of noxious gases by blasting, control and extinguishment of mine fires, and investigation of the causes of mine explosions. Moreover, a considerable number of samples were analyzed in connection with testing and development of equipment designed to promote safety and to protect workers.

Diesel exhaust gas.—A report was issued on the undesirable effects of the presence of exhaust gas in the intake air of Diesel engines. Other reports dealing with the effect of methane in the intake air and of variations in fuel injection are being prepared. A test chamber was installed for studying the odor intensity and irritating effects of Diesel exhaust gas.

Dissemination of contaminated air from stacks.—A report on the discharge of air from ventilation stacks of the Holland vehicular tunnels, New York City, was prepared for publication. The data indicate that the concentration of contaminants in the air discharged from such stacks is diluted to a very low amount within a short distance from the top of the stacks. A wind tunnel has been constructed to obtain similar experimental data on models of stacks. The funda-

mental information sought should be valuable to all concerned with the discharge into the atmosphere of harmful or otherwise objectionable contaminants from stacks.

Effects of repeated exposure to small concentrations of carbon monoxide.—In cooperation with the Port of New York Authority and the United States Public Health Service, a number of men who work in and around the Holland tunnels (and therefore are potentially exposed to carbon monoxide) were given complete physical examinations, including X-rays of chest, electrocardiograms, blood and urine analyses, and determination of blood saturation with carbon monoxide. The data obtained are being analyzed critically to ascertain what effects, if any, have been produced.

Determination of concentration and composition of atmospheric contaminants.—To evaluate the harmful and objectionable effects that may be produced by gases, dusts, and other atmospheric contaminants, it is essential to know the amount and composition of such materials present in the air. Therefore, considerable effort has been expended in developing and improving procedures for making such studies. The pyrotannic acid method for determining carbon monoxide was improved so that carbon monoxide could be detected in smaller quantities with greater certainty. A critical study was made of the phenoldisulfonic acid method of determining oxides of nitrogen, which are generated in using explosives and are present in exhaust gases of internal-combustion engines. A rapid turbidimetric method was adapted to the determination of organic halides used in cleaning coal. Improvements were made in X-ray and petrographic procedures for determining quartz and other minerals present in air-borne dusts that produce silicosis and pneumoconiosis. The spectrograph and dropping mercury electrode were applied to the determination of heavy metals, such as lead and cadmium, that are found in smelter operations, and additional information was obtained on the impinger, electric precipitator, various filters, and other devices for collecting samples of dust from the air.

Safety Division

The Safety Division, working in close cooperation with State departments of mines, coal, metal-mine, and petroleum workers and operators, coal, metal, and petroleum institutes, and other organizations strives through education and investigation to improve safety and working conditions in the mining and allied industries. It provides courses in first-aid training, mine rescue training, advanced training in mine rescue and recovery operations, and accident-prevention training for officials, miners, and petroleum workers; sponsors first-aid and mine rescue contests; shows safety motion

pictures; gives safety exhibits and demonstrations; and conducts safety meetings for officials and employees of mining organizations—all of which serve to disseminate safety knowledge. The division also investigates mine explosions, fires, and miscellaneous accidents; makes safety and health-hazard inspections of mines; and studies other problems influencing health and safety. During the year 225 reports were submitted by field men on mines in 30 States. The more formal reports were sent to the operators with constructive suggestions for improving existing conditions and were greatly appreciated, as scores of answering letters testify.

Manpower is an important asset for defense; consequently, its conservation is a direct contribution to national security. This is especially important in industries charged with the production of strategic minerals and other items that are essential to national defense. The effort to create safer working conditions has brought about improvements that are effective in preventing the initiation of explosions and fires that may result in disasters with concomitant heavy loss of life and property and interruption of production. They are also effective in preventing other types of accidents and in conserving the health of those who produce metals and minerals.

Personnel and equipment.—The field personnel of the Safety Division includes 36 engineers, 27 safety instructors, 22 clerks, and 4 other persons, a total of 89 employees. These are assigned to strategic localities in 16 States and Alaska. Sixty-five Government-owned automobiles and trucks were used by the division, and they traveled 950,000 miles during the year; in addition, privately owned passenger cars traveled 10,000 miles. The division has 7 all-steel railroad coaches equipped for safety training and recovery work following mine disasters, but owing to lack of personnel and funds only 2 were in active use.

First-aid training.—During 1941 the division trained 87,087 employees of the mining and affiliated industries in first aid and in mine rescue operations. The work was conducted in 994 cities situated in 39 States and Alaska. In 1940, 93,878 persons were trained; in 1939, 120,733; and in 1938, 105,093. Since the establishment of the Bureau in 1910 the total number of persons completing first-aid and mine rescue courses is 1,448,552. It is conservatively estimated that at least 200 lives are saved annually by application of first-aid methods taught by the Bureau.

Approximately 80 percent of the first-aid training is done on a cooperative basis whereby company instructors certified by the Bureau of Mines teach their fellow employees, who are examined later by a Bureau representative. This method relieves the Federal Government of much of the burden of the training work and places it on industry, where it belongs. During the year 2,465 persons in

32 States and Alaska qualified to instruct their coworkers in the Bureau's standard first-aid course. Since 1930, 14,592 persons have earned first-aid instructor's certificates; this provides a large corps of capable instructors distributed among two-thirds of the States of the Union and available with little or no loss of time for civilian and military first-aid training. The Bureau's First-Aid Manual was revised and is simply worded, complete, and admirably suited either for first-aid training or for handling emergency first-aid cases. Mines and plants that train all their employees in first aid are issued 100-percent first-aid certificates. During 1941, 179 mines and plants in 19 States were awarded these certificates, increasing the total number awarded to date to 2,699 in 40 States and Alaska.

Mine rescue training.—The Bureau's mine rescue training course was given to 3,204 mine workers, bringing the total number so instructed since the beginning of the work to approximately 75,000. These men, well-trained in the use of gas masks, oxygen breathing apparatus, and procedures connected with fires and explosions in confined places, such as mines and tunnels, also constitute an efficient reserve for use in civilian defense and rescue work, should such be needed because of aerial warfare. During the year 30 privately owned mine rescue stations in 10 States were rigidly inspected as a service to help in maintaining the apparatus in safe condition for emergency use.

Advanced mine rescue training for rescue and recovery operations.—In this course, officials and rescue teams are taught how to organize and proceed promptly with recovery work and extinguishment of mine fires. During the year 106 men were trained in this course, and 1 received additional training. Since its inception in 1926, 3,484 men have completed the course, and 122 have received additional training. The instruction is largely technical, and those who have taken it could serve in defense work as advisers in connection with conditions brought about by explosions or fires from bombing or sabotage.

Accident-prevention training for officials and miners.—It has been found that one of the most effective ways to prevent accidents is to disseminate knowledge of the hazards involved and the methods of eliminating the conditions that cause disasters. The accident-prevention course of the Bureau of Mines is based upon information obtained by safety engineers while investigating mine explosions and other disasters or in making underground inspections. Letters received from coal-mining companies whose men have taken this instruction show that it has resulted in decrease of accidents, improvement in safety practices, better supervision and discipline, and better understanding of responsibility for accidents. This course was inaugurated in 1930, and to date 13,517 mine officials and others have taken it. To supplement these classes a specially designed course, inaugurated last year, is given to miners in occupational groups to teach

them how to perform their work safely. During 1941, 1,075 completed training and 36 took partial courses, making a total to date of 1,221 completely trained and 605 partly trained men. This kind of instruction is inherently so important that every one of the 750,000 persons in the mining industry should take it, but the Bureau's present field force is so inadequate that it can do little more than scratch the surface.

Accident-prevention training for petroleum workers.—During the fiscal year 103 persons completed the course of instruction in petroleum safety, and 310 others attended some of the classes—a total to date of 191 completing the course satisfactorily plus 336 partly trained. A lecture and demonstration in this course is entitled, "What Is Fire and What Causes Explosions?" and deals with the hazard of petroleum vapors. After seeing this presentation, many have declared they will never again risk having volatile explosive liquids in their buildings or homes. The demonstration was made 87 times, before 18,057 persons, during the year.

First-aid contests.—The division aided in conducting 64 first-aid contests in 11 States, which were viewed by 113,625 spectators.

Motion pictures.—Unquestionably motion pictures afford an excellent means of conveying safety instruction to workers. Sound motion pictures restricted to safety were used 280 times at safety meetings and were seen by 41,103 persons during 1941.

Safety exhibits.—Twelve safety exhibits were shown during this fiscal year in 10 States at fairs and expositions in mining districts and at mining conventions.

Safety meetings.—The Safety Division was represented at 913 safety meetings in 36 States attended by 123,506 persons. At many of these meetings the representative was the principal speaker; this afforded an opportunity to disseminate practical mine safety knowledge gleaned from the work of the Bureau on accident prevention and the conservation of life, health, and property. During the year 16 new Holmes Safety chapters were organized, bringing the total number of these local associations to 504 in 29 States.

Investigations of mine fires, explosions, and other accidents.—The Safety Division investigated 21 mine explosions in 10 States and 16 mine fires in 8 States. Personnel of the division assisted in the rescue and recovery work at virtually all of them where life was lost or property jeopardized. Deaths in mine explosions totaled 155, including 137 in 7 major disasters. This compares favorably with 206 deaths in the fiscal year 1940, of which 191 occurred in 3 major disasters, but it does not equal the 1939 record, when no single explosion or mine fire cost 5 or more lives. The necessary rapid expansion of mining production for defense tends to increase the likelihood of explosions and fires unless all possible precautions are taken to avoid them.

Preventive methods advocated by the Bureau include uninterrupted ventilation; use of closed lights, permissible explosives, and permissible electrical equipment; allaying of explosive dust; and proper rock dusting of mines. In 6 of the coal-mine explosions that occurred during the year it seems probable that the widespread use of rock dust prevented the explosions from propagating throughout the mines and thus saved the lives of some or all of the 864 men who were in the mine at the time of the catastrophes and who came out alive.

Miscellaneous accidents.—The division investigated 70 miscellaneous accidents in 17 States and Alaska, including slides, roof falls, explosives, failure of hoisting skip, runaway cars, electricity, and explosions (on the surface) of chemicals, explosives, and dusts. Sabotage of defense plants was suspected in several instances.

Metallic-dust explosions.—Protection against metallic-dust explosions is important at this time, particularly in plants manufacturing magnesium powder, because virtually the entire output of such plants is used in flares, tracer bullets, and other military products. One line of the Bureau's work is directed toward enlarging our knowledge of the behavior of metal- and mineral-dust explosions and the development of protection against the hazard.

Safety inspections and health-hazard investigations.—As a service to the mining industry the Safety Division made 21 complete safety inspections and reports on mines in 8 States and Alaska. These reports discussed both commendable and hazardous conditions and contained appropriate recommendations for correction of the latter. Copies of these reports were submitted to the management and invariably were given grateful acknowledgment. In many instances Bureau engineers on subsequent visits noted that the recommendations had been adopted.

Other activities.—Other activities of the division included assistance in the revision of the mining laws of several States, one of which suffered some major mine-explosion disasters in 1940; advice to various groups interested in prevention of flooding of anthracite mines; and aid in preventing ill health and loss of life in driving the 85 miles of tunnels of the New York Aqueduct.

Administrative Branch

The Administrative Branch includes the Information and Office Administration Divisions.

Information Division

The Information Division edited and distributed publications, supervised motion-picture production and circulation, maintained the Bureau library, and prepared exhibits.

Editorial.—During the fiscal year 6 bulletins, 10 technical papers, 1 miners' circular, 72 chapters comprising Minerals Yearbook (Review of 1940), 1 schedule, 1 annual list and index of publications, 12 monthly lists of publications, 1 motion-picture list, and 1 revised handbook were edited and sent to the printer—a total of 105 printed publications. Moreover, during the year 42 publications were prepared and sent for reprinting, including 2 technical papers, 32 Minerals Yearbook chapters, 6 miscellaneous publications, and 2 handbooks. The editorial section also edited 51 reports of investigations and 47 information circulars, as well as 22 periodical, cooperative, and miscellaneous reports. Printing funds permitted only part of the Bureau's output to be published at Government expense; consequently, 198 papers were prepared for the technical and trade press. The reports handled during the year—465 in all, compared with 507 in 1940—involved the editing of 17,300 pages of manuscript.

Publications.—During the fiscal year 157,000 copies of the free editions of Bureau publications and approximately 350,000 reports of investigations, information circulars, and lists of publications were distributed by the publications section. In addition, the Superintendent of Documents sold about 100,000 copies of the Bureau's printed reports. Numerous brief statements announcing the issuance of new publications, describing current investigations, or presenting statistical data on mineral production were supplied to the press and the public. About 72,000 letters requesting publications or information on the Bureau's activities were received and answered.

Library.—The year's accessions to the library comprised 4,677 books, 400 periodicals were received currently, and 25,179 books and periodicals were loaned for use outside the library.

Motion-picture production.—To help disseminate information on safety and efficiency in the mineral industries, the Bureau maintains a library of educational motion-picture films believed to be the largest in the world. These films are prepared under the supervision of the Information Division through cooperation of industrial concerns that bear the entire cost of production and of providing copies for loan by the Bureau. During the year 568 sets of new films, comprising 1,085 reels, were added to the library.

Motion-picture circulation.—Circulation of the Bureau's motion-picture films is centralized at the Pittsburgh (Pa.) Experiment Station, but there are 17 subdistributing centers throughout the country, selected with regard to accessibility. The films are loaned to schools, churches, civic and business clubs, miners' local unions, chapters of the Holmes Safety Association, and similar organizations. No charge is made for use, but exhibitors are asked to pay transportation charges. On June 30, 1941, the Bureau had 3,205 sets of films, including 5,981 reels and aggregating 2,502,000 feet. During the year films were

shown on 111,045 occasions to an attendance of 10,910,750 persons.

Graphic services.—Graphic services, including drafting and photography, are also centralized at Pittsburgh. More than 1,100 drawings were prepared and over 34,000 prints of various types made.

Exhibits.—The division prepared and installed 13 exhibits illustrating Bureau activities at expositions and conventions.

Office Administration Division

The Office Administration Division handles personnel matters, property records, accounting, multigraphing and mimeographing, and general administrative routine.

Personnel.—On June 30, 1941, there were 1,209 full-time employees on duty in the Bureau, distributed as shown in the following table:

	Classification and number of appointees				
	Profes- sional	Subpro- fessional ¹	C. A. F.	Custo- dial ²	Total
Washington.....	³ 46	3	187	9	245
Pittsburgh.....	⁴ 109	57	72	61	299
Field.....	⁵ 317	94	126	128	665
Total.....	472	154	385	198	1,209

¹ Includes instrument makers, safety instructors, laboratory aids, assistants, etc.

² Includes laborers, mechanics, messengers, etc.

³ Engineers, 15; chemists, 2; miscellaneous, 29; total, 46.

⁴ Engineers, 46; chemists, 44; miscellaneous, 19; total, 109.

⁵ Engineers, 137; chemists, 58; miscellaneous, 122; total, 317.

In addition to the foregoing full-time employees, the following employees held appointments on a when-actually-employed basis: 35 consultants; 112 excepted; 10 classified; 2 unclassified; and 464 field agreements.

Property.—Records as of June 30, 1941, show the following valuation of Bureau property:

Automobiles and trucks.....	\$158,278.17
Canvas and leather goods.....	7,052.87
Drafting and engineering instruments.....	13,808.92
Electrical equipment.....	53,356.70
Hardware and tools.....	48,559.16
Household equipment.....	23,715.64
Laboratory equipment.....	713,414.75
Medical equipment.....	21,340.38
Office furniture and equipment.....	438,784.12
Photographic apparatus.....	45,069.20
Machinery and power-plant equipment.....	1,127,928.41
Land, buildings, and improvements.....	3,290,605.95
Rescue cars and specialized apparatus.....	350,706.60
Helium properties in Thatcher, Colo., and Dexter, Kans., consisting of real estate, leases, and equipment.....	537,975.23
	6,830,596.10

This property is in Washington and at the various field stations and offices of the Bureau.

Finances

The total funds available to the Bureau of Mines for the fiscal year ended June 30, 1941, including direct appropriations, departmental allotments, reappropriated balances, and sums transferred from other departments for service work, were \$5,740,155. Of this amount, \$5,177,797 was spent, leaving an unexpended balance of \$562,358. On the regular work of the Bureau, \$3,331,439 was expended. These figures are subject to revision because of unpaid obligations.

Table 1 presents classified and complete information regarding the financial history of the Bureau since its establishment in 1910.

Table 2 gives a statement of the distribution of congressional appropriations to the branches and divisions and the expenditure of these funds in 1941 by Bureau divisions.

TABLE 1.—Bureau of Mines appropriations and expenditures, fiscal years ended June 30, 1911–41

Fiscal year	Appropriated to Bureau of Mines	Departmental allotments ¹	Funds transferred from other departments ²	Total funds available for expenditure	Unexpended balances	Total expenditures	Expenditures, exclusive of service items ³
1911-----	\$502,200.00	\$34,200.00	-----	\$536,400.00	\$22,818.27	\$513,581.73	\$513,581.73
1912-----	475,500.00	45,640.00	-----	521,140.00	6,239.77	514,900.23	514,900.23
1913-----	583,100.00	47,850.00	-----	630,950.00	4,087.20	626,862.80	626,862.80
1914-----	664,000.00	57,307.79	-----	721,307.79	4,678.29	716,629.50	716,629.50
1915-----	730,500.00	55,424.60	-----	785,924.60	4,178.11	781,746.49	781,746.49
1916-----	757,300.00	48,710.87	-----	806,010.87	9,058.63	796,952.24	796,952.24
1917-----	981,060.00	52,400.00	-----	1,033,460.00	48,588.10	984,871.90	984,871.90
1918-----	1,467,070.00	51,901.98	\$3,062,000.00	4,580,971.98	395,745.10	4,185,226.88	1,172,939.64
1919-----	⁵ 3,245,285.00	49,542.86	⁶ 8,600,000.00	11,894,827.86	2,452,236.78	9,442,591.08	1,137,471.37
1920-----	1,216,897.00	52,800.00	-----	1,269,697.00	9,592.18	1,260,104.82	1,245,891.36
1921-----	1,362,642.00	62,618.72	666,720.00	2,091,980.72	13,985.89	2,077,994.83	1,412,923.15
1922-----	1,474,300.00	59,800.00	182,200.00	1,716,300.00	52,120.45	1,664,179.55	1,483,038.47
1923-----	1,580,900.00	70,814.30	97,100.00	1,748,814.30	10,959.08	1,737,855.22	1,640,840.57
1924-----	1,784,959.00	50,710.00	347,820.00	2,183,489.00	38,085.43	2,145,403.57	1,804,800.41
1925-----	2,028,268.00	57,500.00	236,465.86	2,322,233.86	107,743.20	2,214,490.66	1,998,669.20
1926-----	1,875,010.00	81,220.00	510,501.15	2,466,731.15	28,891.78	2,437,839.37	1,841,150.80
1927-----	1,914,400.00	94,443.39	325,000.00	2,333,843.39	44,871.29	2,288,972.10	1,926,910.12
1928-----	3,025,150.00	113,266.45	328,000.00	3,466,416.45	⁷ 736,235.62	2,730,180.83	1,997,270.66
1929-----	2,725,118.00	103,000.00	205,500.00	⁷ 3,753,094.67	⁸ 152,701.34	3,600,393.33	2,280,960.68
1930-----	2,274,670.00	123,300.00	166,200.00	⁸ 2,684,386.38	⁹ 135,714.93	2,548,671.45	2,216,995.72
1931-----	2,745,060.00	120,680.91	166,500.00	⁹ 3,134,595.10	¹⁰ 195,534.37	2,949,060.73	2,304,121.45
1932-----	2,278,765.00	137,866.48	194,500.00	¹⁰ 2,770,712.18	¹¹ 344,689.43	2,426,022.75	2,186,799.92
1933-----	1,860,325.00	75,100.00	184,000.00	¹¹ 2,361,138.96	¹² 475,895.41	1,885,243.55	1,710,949.42
1934-----	1,574,300.00	50,230.00	17,000.00	¹² 1,872,586.04	¹³ 397,131.28	1,475,454.76	1,254,846.72
1935-----	1,293,959.07	50,000.00	126,513.10	¹³ 1,520,472.17	¹⁴ 34,154.47	1,486,317.70	1,349,490.11
1936-----	1,970,311.00	69,500.00	47,570.00	¹⁴ 2,114,966.51	¹⁵ 14,074.34	2,100,892.17	2,052,751.87
1937-----	2,093,200.00	69,000.00	73,000.00	¹⁵ 2,237,812.45	¹⁶ 8,700.66	2,229,111.79	2,161,472.73
1938-----	2,272,720.24	83,000.00	62,300.00	¹⁶ 2,421,985.69	¹⁷ 59,920.71	2,362,064.98	2,286,858.08
1939-----	2,892,880.01	88,790.00	96,650.00	¹⁷ 3,086,719.30	¹⁸ 77,198.05	3,009,521.25	2,480,485.08
1940-----	2,980,498.88	93,290.00	94,000.00	¹⁸ 3,181,330.29	¹⁹ 106,528.03	3,074,802.26	2,946,470.26
1941-----	3,341,948.00	91,790.00	2,225,400.00	¹⁹ 5,740,155.00	²⁰ 562,358.00	5,177,797.00	3,331,439.00
1942-----	5,566,470.00	97,490.00	231,000.00	²⁰ 6,403,574.95	-----	-----	²¹ 5,499,303.00

¹ Includes printing and binding, stationery, and contingent funds.

² Includes proceeds from sales of residue gas.

³ Service items include Government fuel yards, helium, and other investigations and services for other departments.

⁴ Includes gas investigations for War Department.

⁵ Includes \$1,586,388 for Government fuel yards.

⁶ Includes War Minerals Relief Commission, \$8,500,000.

⁷ Includes \$719,476.67 unexpended balance reappropriated.

⁸ Includes \$120,216.38 unexpended balance reappropriated.

⁹ Includes \$102,354.19 unexpended balance reappropriated.

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¹⁰ Includes \$159,580.70 unexpended balance reappropriated.

¹¹ Includes \$241,713.96 unexpended balance reappropriated.

¹² Includes \$231,056.04 unexpended balance reappropriated.

¹³ Includes \$50,000 unexpended balance reappropriated.

¹⁴ Includes \$27,585.51 unexpended balance reappropriated.

¹⁵ Includes \$2,612.45 unexpended balance reappropriated.

¹⁶ Includes \$3,965.45 unexpended balance reappropriated.

¹⁷ Includes \$8,399.29 unexpended balance reappropriated, and balance of \$35,544.39 receipts from sale of helium and other products.

¹⁸ Includes \$13,541.41 unexpended balance reappropriated, and balance of \$58,822.55 receipts from sale of helium and other products.

¹⁹ Includes \$6,000.00 unexpended balance reappropriated, and balance of \$85,452.95 receipts from sale of helium and other products.

²⁰ Includes \$421,598 balance reappropriated, and balance of \$87,017 receipts from sale of helium and other products.

²¹ Estimated.

TABLE 2.—Bureau of Mines expenditures, fiscal year 1941

Branch or Division	General expenses	Operating rescue cars and stations and investigation of accidents	Testing fuel	Mineral mining investigations	Oil and gas investigations	Expenses mining expert-ment stations	Economics of mineral industries	Care, etc., buildings and grounds, Pittsburgh, Pa.	Investigation of domestic sources of mineral supply	Helium production	Development and operation of helium of properties	Expediting production equipment and supplies	Maintenance, Bureau of Ships	Working fund	Working fund	Working fund	Printing and binding	Contingent expenses	Total	
Office of the Director	\$11,600	\$3,053				\$140														\$14,793
Office of the Assistant to the Director	6,417					233														6,650
Total	18,017	3,053				373														21,443
Administrative Branch:																				
Office Administration Division	42,728	17,882				7,351	\$23,427		\$13,970	\$3,849	\$1,307	\$9,623					\$3,003	\$6,395	132,104	
Information Division	1,827	13,641	\$12,281	\$11,892	14,164	15,652	12,108	\$5,511	2,381								4,370		93,827	
Total	44,555	31,523	12,281	11,892	16,733	23,003	35,535	5,511	16,351	3,849	1,307	9,623					7,373	6,395	225,931	
Technologic Branch:																				
Coal Division		87,327	250,893					94,304									8,353		440,877	
Explosives Division		97,075															469		174,417	
Metallurgical Division				125,000		262,517			113,012			1,300,175	\$3,999			\$1,094	3,174	1,807,877		
Mining Division			122,821			6,021			492,521			279,859	4,629				6,499	969,301		
Nonmetals Division		56,951				281,675											24		281,699	
Petroleum and Natural-Gas Division					242,916					87,896	63,197					\$14,951	1,183		410,143	
Principal Mineral Technologist				12,416															12,416	
Total		241,353	250,893	260,237	242,916	550,213		94,304	605,533	87,896	63,197	1,580,034	8,628	75,779	14,951	1,094	19,702		4,096,730	

TABLE 2.—Bureau of Mines expenditures, fiscal year 1941—Continued

Branch or Division	General expenses	Operating rescue cars and stations and investigation of accidents	Testing fuel	Mineral mining investigations	Oil and gas investigations	Expenses mining experiment stations	Economics of mineral industries	Care, etc., buildings and grounds, Pittsburgh, Pa.	Investigation of domestic sources of mineral supply	Helium production	Development and operation of helium properties	Expediting production equipment and supplies	Maintenance, Bureau of Ships	Working fund	Working fund	Working fund	Printing and binding	Contingent expenses	Total
Economics Branch:																			
Coal Economics Division.....							\$28,740										\$354		\$29,094
Foreign Minerals Division.....							46,429												46,429
Metal Economics Division.....							66,602										992		67,594
Mineral Production and Economics Division.....							109,996										28,756		138,752
Nonmetals Economics Division.....							65,992										1,413		67,405
Petroleum Economics Division.....							59,832										708		60,600
Total.....							377,591										32,283		409,874
Health and Safety Branch:																			
Safety Division.....		\$349,522															24,226		373,748
Health Division.....		50,071																	50,071
Total.....		399,593															24,226		423,819
Total appropriations.....	\$64,000	676,000	\$263,900	\$278,060	\$260,000	\$587,000	\$421,020	\$109,000	\$625,000	\$97,000	\$151,521	\$2,000,000	\$8,700	\$96,700	\$15,000	\$2,000	\$5,290	\$6,500	\$5,740
Total expenditures.....	62,572	673,522	263,174	272,129	239,649	573,589	413,126	99,815	621,884	91,745	64,504	1,589,657	8,628	75,779	14,951	1,094	83,584	6,395	5,177
Balances.....	1,428			5,931	351	13,411	8,794	185	3,116	15,255	187,017	1,410,343	72	120,921	49	906	1,706	105	562,358

1 Available for expenditure in fiscal year 1942.

Bituminous Coal Division

HOWARD A. GRAY, Director

1. Bituminous Coal and Defense

THREE important developments marked the bituminous coal industry during the fiscal year which ended on June 30, 1941. They may be summarized, briefly, as follows:

1. The emphasis which the defense program has placed upon bituminous coal as the Nation's major source of fuel and energy and as a source for raw materials for the manufacture of a wide range of necessary products.

2. The extension of the life of the Bituminous Coal Act of 1937 by act of Congress, which has assured the continuance of basic stabilization of the coal industry for 2 more years.

3. The establishment of minimum prices and marketing rules and regulations under the Coal Act, which has brought stability to the coal industry and order to the Nation's coal markets for the first time in nearly 20 years.

Coal Most Important Fuel

Bituminous coal is used, more than any other fuel, to heat, light, and operate homes, factories, shops, offices, and transportation facilities. It furnishes more than 70 percent of all fuels used in the generation of electricity. It constitutes more than 80 percent of all the fuel used by railway locomotives. It provides approximately 75 percent of the power and fuel used by general manufacturing plants.

As a source of raw materials, coal is necessary for the manufacture of a wide variety of products, such as steel, coke, medicines, explosives, paints, order plastics, dyes, and other chemicals.

The production of bituminous coal in 1940 was approximately 453,000,000 tons, which was higher than that for any year since 1930, when it totaled approximately 468,000,000 tons. Division economists have estimated that the 1941 bituminous coal requirements will approximate 500,000,000 tons, or the largest production for any year since 1929. This heavy increase in coal requirements is occasioned largely

by the industrial activity in connection with the national-defense program.

Industry Heaviest User

All but a small part—about 20 percent—of the bituminous coal produced is purchased for industrial use, rather than for heating purposes. Without a constant and adequate supply, steel mills soon would grow cold, trains would stop running, street railways would cease functioning, factories would close, and electric lights, water service, and perhaps even the fuel gas used in our home no longer would be available. Nearly every phase of our economic and social life would be affected and national security would be menaced.

Because of its bulk and its combustible qualities, together with the fact that it degrades rapidly, coal generally is not stored in any great quantity. Except for the public utilities, most industrial consumers seldom store in excess of a month's supply. Many users keep on hand no more than a week's supply, and depend upon a continuous and uninterrupted flow of coal from the mines.

Coal Supply Vital

Within a short time after coal shortages are experienced at consuming plants, they are forced to curtail operations, and the sudden impact of scarcity of supply causes prices to rise rapidly. Therefore, in a time of emergency such as this, past experience has shown that bituminous coal is one of the vital elements of national security and that a constant supply is of paramount importance.

Wage agreements between the miners and operators expired March 31, 1941. New agreements were not reached immediately, which resulted in the suspension of the larger part of the coal production during April. Temporary agreements signed late in April were subsequently followed by those now effective until March 31, 1943.

Coal Shortages Possible

It is entirely possible that an emergency may arise during the ensuing fiscal year which would affect the coal supply and make it necessary for the Government to exercise some type of regulation over coal distribution and market prices. Studies made by Division economists indicated that the danger of shortages due to transportation difficulties could not be ignored. In addition, there was no guarantee that mine-production capacity would be adequate to meet requirements for all grades and required kinds of coals. Some indications of possible deficiencies in mine-production capacity for certain grades and kinds of coals already have been reported.

However, the possibility was seen that by early detection of the trends and the exercise of foresight, such shortages might be averted. Consumers, having been warned, were given an opportunity to build up their storage piles in advance of the peak season, and the railroads were expanding their facilities.

Activities Geared to Defense Needs

While carrying out its ordinary responsibilities in administering the Bituminous Coal Act, the Bituminous Coal Division also has geared its activities to the needs of the national defense program, and has cooperated from time to time with the other defense agencies of the Government in matters concerning bituminous coal.

The Division has assembled and maintains what perhaps is the most complete storehouse of information concerning the production, marketing, transportation, and distribution of bituminous coal ever compiled. In doing this, it has established, and maintains, channels of direct communication with the more than 15,000 individual units of the coal-producing industry, and the several thousand individual sales and distribution media. Also, administration of the act has brought about the organization of the industry for effective, coordinated, joint action in cooperation with the United States Government.

Experience and Information Valuable

Awareness of the value of its experience and information in helping to assure a continuous and adequate supply of bituminous coal caused the Division to prepare itself to assist in solving such coal problems as might arise in connection with the national defense program. On numerous different occasions during the past fiscal year, it has been called upon by defense agencies for this purpose. Two significant illustrations are noted below.

With the suspension of coal production on April 1, 1941, following prolonged continuance of wage negotiations between mine operators and employees at a time of high industrial activity, the Price Stabilization Division of the Advisory Commission on National Defense found immediate action necessary to prevent run-away coal prices. The Bituminous Coal Division was called upon to furnish necessary information and its resources were placed at the defense agency's disposal.

Temporary Price Ceiling

On April 3, 1941, 3 days after the initiation of the strike, the Price Stabilization Division issued, under its emergency powers, an order establishing a temporary ceiling for coal prices. Under this order,

no bituminous coal was permitted to be sold by producers, distributors, retailers or other sellers at prices in excess of those prevailing on March 28, 1941, except in cases where increases were shown to be justified. This price control was intended as a temporary expedient and with the cessation of the strike, the price ceiling was revoked.

The price ceiling was designed to maintain price stability with respect to the small amounts of coal available for sale from dealers' stocks during the strike period. In addition, when the mines were reopened, the first shipments of coal moved to market under the controlled prices. As a consequence, there was no precipitate rise in prices during this emergency, and no equally sharp fall.

Strike Mediation

When the wage controversy reached the National Mediation Board, the Coal Division again was called upon to cooperate. It was asked to furnish statistical information necessary for settling the dispute between the mine owners and mine workers. A division expert, aided by a staff of technicians, was assigned to work with the Board on technical matters and to furnish promptly whatever statistical or economic data were required. Compilations of cost figures, showing average costs of production for the various producing districts in 1940 and earlier years, were made available in usable form to all interested parties and to the Board.

Defense Burden Upon Coal Industry Heavy

The magnitude of the national defense program places very heavy responsibilities upon the bituminous coal industry. Unless civilian activity comes to a standstill and unemployment mounts rapidly, coal supplies must be available for production of peacetime goods. Essential functions, such as running hospitals, heating homes, apartments, and business offices, require regular supplies of coal. The problem of the coal industry is to meet the enlarged demand for its product arising from the defense program, and, in addition, to continue to meet necessary civilian requirements.

No doubt many of the problems concerning coal which came up during the last World War may be avoided this time, should a coal crisis occur. If Government control of coal is to be effective, the agency handling the problem must have detailed knowledge of the operation of the industry. In the last war no such knowledge was immediately available, but had to be acquired after the crisis had developed. For months, the defense program was continually threatened and definitely impeded by the delays in solving the coal problem.

Information Now Available

A vast part of the essential basic data which would be necessary for Government control of coal in time of emergency is already available now in the files of the Bituminous Coal Division, and machinery already is functioning which may be used for the collection of additional information. The Division has detailed statistics on costs of production for each mine, average costs of production for each producing district, as well as data on selling costs. It has information as to the volume of coal produced by each mine and district and the kinds and qualities of these coals, the modes of shipment and the markets served. Its files contain information on the amounts and kinds of coal consumed by practically every important coal user in the country, the originating mines supplying these consumers, the method of transportation used, and the prices charged.

This type of detailed data is essential to coal regulation in an emergency. The availability of detailed information to aid in effecting prompt settlement of the many questions as they arise spells success or failure in maintaining the regular flow of coal from mine to market.

Maximum Prices

Whenever the Division deems it necessary to establish maximum prices as a means of protecting the coal-consuming public against unreasonably high prices, the Coal Act gives the Division this power. As of the close of the fiscal year ending June 30, 1941, the Division had not found it necessary to exercise such power. (On July 23, 1941, the Bituminous Coal Consumers' Counsel filed a petition with the Division requesting the establishment of maximum prices for bituminous coal. On August 13, 1941, the Director of the Coal Division issued an order scheduling a hearing on this application beginning September 9, 1941).

Coal Problem in World War I

In the First World War, bituminous coal constituted a major problem. The difficulty was not one of the lack of sufficient coal reserves or of adequate mine capacity. It was mainly one of transportation. The congestion and prolonged tie-ups in shipping facilities created a scarcity of coal in consuming markets and necessitated a detailed program of regulation by the Federal Government. This involved control over transportation facilities, regulation of distribution, establishment of a priority system, and maximum prices governing all sales from the mine through wholesaler and retailer.

However, months were lost before the coal crisis could be met effectively. The transportation system for bituminous coal is extraordi-

narily complex. Coal is shipped all-rail, by river, by a combination of rail and river, rail and Great Lakes, rail and "Tidewater", by motor-trucks, by combinations of trucks and rail, etc. Approximately 90 percent of all coal produced is shipped by railroad either all or part of the way from mine to destination. The partial suspension of water shipments in the last World War placed very heavy additional responsibilities upon the railroads. It also occasioned drastic changes in the normal distribution pattern for coals.

Problem of Control Complex

That shift in distribution, in turn, required readjustment and re-adaptation. Bituminous coal is a highly unstandardized commodity. Unlike gas, oil and electricity, it is not generally processed into a fairly homogeneous product. Except for sizing and cleaning, the raw material itself is shipped to market. This means an infinite variation in burning characteristics, coking qualities, sulphur and ash content and other characteristics of the various coals. There are also a great multiplicity of sizes. For certain uses, such as coking coals, there are very decided limitations upon the kinds of coals which can be used. In general, burning equipment is designed to utilize the coals that normally come into the particular market. Any shift in source of supply requires an adaptation of coals to the available equipment. Similarly, equipment is constructed for the utilization of certain sizes; and the possibilities of substitution are limited by the character of the furnace.

Present Danger of Shortages Seen

Numerous factors have indicated the possibility that coal shortages might result from transportation difficulties during the ensuing fiscal year, and pointed to the fact that the Government again might find it necessary to exercise emergency control over coal. Among those factors are the declining supply of surplus railway coal cars available to meet estimated seasonal increases in production, and the growing uneasiness of the industry and the consuming public concerning this problem.

It has been felt that if the diminishing trend in surplus coal-car supply were maintained, and the railroads were not able to get new cars into service in quantities sufficiently large, the surplus car supply would be entirely wiped out by the time the seasonal peak in coal production arrived. This would mean coal-car shortages at the mine. Serious and prolonged coal-car shortages are quickly translated into coal shortages because of the inability of the mines to make shipments.

Since coal is not generally stored at the mines, car shortages also mean the loss of mine operating time which it would be difficult, if not impossible, to make up during the period of heavy coal requirements.

The railway car supply is of particular importance to coal transportation. However, in view of the growing tightness of the transportation situation, other factors have also been considered, such as diverting coal cars to transportation of other essential commodities; labor supply; locomotive equipment; terminal facilities; delay in the return of cars to the mines; loading cars under their capacity.

At the end of June 1940, the surplus coal cars, above those currently in use each day, which were available for meeting increases in production, were averaging approximately 43,000 cars daily. According to Association of American Railway statistics, the daily average of surplus cars ranged from approximately 24,000 to 66,000 cars during the year of 1940.

However, association statistics showed that, by June 14, 1941, the available supply of surplus coal cars had diminished to 17,926 cars. This means that about 98 percent of the Nation's total supply of approximately 743,000 coal cars was then in use, hauling either coal or other heavy bulk commodities such as building supplies, iron ore, sugar beets, etc. The effect of the activities of the railroads in increasing their car supply and locomotive equipment remained to be seen.

Production Increases

During June 1941, coal production ranged from 9,500,000 tons per week to approximately 10,000,000 tons per week, as compared with an average weekly tonnage of about 8,000,000 tons in June 1940. Division economists have estimated that if coal requirements are met, the effect of seasonal factors would necessitate a weekly production of from 11,000,000 tons to 12,000,000 tons being maintained during some period late in the summer and fall of 1941.

As previously stated, Division economists estimated that 1941 bituminous coal requirements would approximate 500,000,000 tons, as compared to a production of 483,000,000 tons in 1940. The loss of a month's mine operating time and the depletion of consumers' stock piles due to the coal strike increased the burden upon the mines and the transportation system for the last half of the year. Consumers' stock piles were reduced from approximately 50,000,000 tons to approximately 22,000,000 tons by the strike.

Coal Shortages May Occur

Economists have pointed out that if a coal production of over 11,000,000 tons per week were to be maintained for a period of several weeks, coal car shortages would be extremely likely to occur, in view of the declining supply of surplus coal cars, and the demand for cars for other commodities.

Such shortages, if they occur, were said to be most likely to come during the peak in seasonal influence on coal production, when heavy shipments of coal to lower Great Lakes ports still are in progress. In view of the defense program, it seemed unlikely that there would be any lessening in the demand for railroad cars for hauling other commodities. In fact, it was believed that this demand might even increase as business generally increases in the fall. However, when the Great Lakes freeze over, usually in November, steamers no longer will be able to carry coal to the upper Great Lakes docks for winter storage. This would release a great many railroad cars, and be a large factor in helping to meet the peak in seasonal requirements.

Production Shortages Possible

Shortages already have occurred in the mine production capacity for certain kinds and sizes of coals. However, they were confined to certain special-use coals, such as "coking" coals, used mainly for the manufacture of steel, explosives, chemicals, medicines, and coal byproducts. If the present defense emergency and its demands upon coal continue for any length of time, more general production shortages may occur. Trade journal reports and other sources indicate that purchasers are demanding the better grades of coal faster than they can be produced in some coal fields.

The inability of mine operators to get necessary mining machinery and the increased demand for coal due to the possible shifting from oil to bituminous coal and other solid fuels, because of deficiencies in oil transportation to the Atlantic Coast States, were additional factors contributing to the situation.

Mine Mechanization Creates Problems

The increase in mine mechanization has caused heavy reliance to be placed upon machinery for the production of coal. Modern reliance upon the machine process means that coal production is directly tied to the availability of machines and supply parts and a corps of skilled labor.

The marked increase in mechanization of mines in recent years adds a problem which was nonexistent in the last war. In 1917 about 55 percent of the underground output was cut by machine. Today the figure is approximately 90 percent. Mechanical coal loading was not commercially used during the last World War. Today at least 30 percent of the coal is loaded mechanically. "Strip mining," in which huge power machinery is used, had hardly passed beyond the experimental stage. Today about 10 percent of the total production is "strip mined."

2. Conditions in the Coal Industry

With stability provided under the Bituminous Coal Act of 1937, the bituminous coal industry began to market its coal on October 1, 1940, at prices which, for the first time in nearly 20 years, approximated the industry's costs of production. That was the date upon which the minimum prices and marketing rules and regulations, established by the Bituminous Coal Division under the Coal Act, became effective.

Minimum prices were set at levels, as required by the Coal Act, which would give the coal producing industry an income which would be equal, as nearly as may be, to its average cost of production, and thus maintaining a "cost-floor" under the price of coal at the mine. The marketing rules and regulations were designed to prevent evasions of the minimum prices and to effectuate provisions of the Coal Act which prohibit unfair trade practices.

The establishment of minimum prices and marketing rules and regulations marked the end of the ruthless price cutting and destructive marketing practices which had kept the coal industry impoverished and in chaos during the past two decades. Conditions in the industry were so perpetually demoralized that the Nation's coal supply was threatened or impaired many times during that period.

Life of Coal Act Extended

The importance of assuring continuance of the stable conditions in the coal industry which have been brought about under the Coal Act is paramount, particularly in the face of the present national emergency.

The Coal Act, as originally passed, was to have expired as of April 26, 1941, in absence of additional legislation.

In the spring of 1941, shortly before it would have expired under its original terms, Congress enacted a measure extending the act for 2 more years. The act does not now expire until April 26, 1943.

The market stabilization machinery erected under this act involved three and a half years of intensive, cooperative effort by the Government, the coal industry, and consumers' representatives, including the Consumers' Counsel. It became effective at the beginning of the increasing demand for coal due to the defense program. The demand for coal since has increased still more, and producers were enjoying their most active market since 1929 at the close of the fiscal year.

Stabilization Helps Market Prices

The stabilization of the industry under the Coal Act and the increased demand for coal was making it possible for some producers to sell

certain grades and sizes at prices higher than the currently effective minimum prices at the close of the fiscal year ending June 30, 1941. After October 1, 1940, a great deal of coal still was sold at the minimum prices, although the general trend in the industry was toward higher than minimum prices.

Also, the coal industry contends that the cost levels reflected by the present minimum prices were lower than the industry's actual costs, because of the new wage rates paid by the industry. At the close of the fiscal year ending June 30, the Division was conducting a proceeding to determine what changes, if any, have occurred in the costs of producing coal, to the end that the minimum prices might be changed accordingly. This proceeding is discussed in more detail in another part of this report.

In considering the market prices for coal, it should be borne in mind that the minimum prices established by the Coal Division are "cost level" prices. They are designed to provide basic market stability and prevent price cutting, so that producers, with this protection, may conduct their business in a sound manner, free from huge deficits.

The history of the coal industry and a study of present conditions show that the increased demand for coal would be insufficient as a substitute for the basic stabilization now provided under the Coal Act.

Statistics compiled by the Division show that producers continued to sell their coal at prices substantially under the average cost of production right up to the day minimum prices and marketing rules and regulations became effective. The average price which producers received for their coal during the nine months immediately preceding October 1, 1940, was approximately 5 cents per ton less than the industry's average cost of production for that year (as indicated by the Division's cost statistics).

The average loss was sustained despite the great strides which the industry had made in reducing its costs of production. The preliminary 1940 cost statistics indicated that the industry had reduced its costs of production on an average, approximately 18 cents per net ton since the Division determined the 1936 adjusted costs, upon which the minimum prices were computed.

Table Shows Prior Price Deficiencies

Table 1 shows the average mine prices realized from the sale of coal during the first nine months of 1940 compared with the weighted average costs per net ton covering all mines for that year (as indicated by cost statistics issued by the Division).¹

¹ These figures are taken from exhibits introduced in evidence by the Division in the proceeding (designated General Docket No. 21) being held for the purpose of determining whether there have been such changes in the weighted average costs of production within prescribed minimum price areas as to require changes to be made in the effective minimum prices. No ruling has been made by the Director on these figures.

TABLE 1.—Average mine price realized by coal producers during first 9 months of 1940 based on invoice data,¹ compared with preliminary weighted average production cost figures for 1940 for all mines²

Price area	Weighted average cost	Average mine price realization
No. 1: (Pennsylvania, Maryland, West Virginia, Ohio, Michigan, Virginia, Eastern Ky., Northeastern Tennessee).....	<i>Per ton</i> \$1.9429	<i>Per ton</i> \$1.8516
No. 2: (Western Ky., Illinois, Indiana and Iowa).....	1.5587	1.6294
No. 3: (Alabama, Southeastern Tenn.).....	2.3122	2.3531
No. 4: (Arkansas-Oklahoma).....	3.2882	3.2905
No. 5: (Missouri-Kansas-Oklahoma).....	1.8366	1.9794
No. 6: (Colorado, New Mexico, Arizona).....	2.5166	2.6059
No. 7: (Wyoming, Idaho, Utah).....	1.8924	2.0567
No. 9: (Montana).....	1.3370	1.3984
No. 10: (Washington, Oregon).....	3.0885	3.1346
Total, United States.....	1.9002	1.8464

¹ In general, the realization shown in the above table is similar to that of the commercial mines shown for previous years, but is not entirely comparable due to the fact that realization compiled from invoices includes some realization from the sale of "captive" coal in certain districts. Realization data is listed in this table merely for reference and to indicate the level of 1940 prices prior to October 1, when minimum prices became effective. It is subject to further revision.

² These are preliminary weighted average costs per ton for all mines for the full year of 1940, as indicated by cost data recently compiled by the Division.

Huge Deficits Previously

The coal industry's history shows that it suffered huge net deficits in years when the demand for coal was a great deal higher than it was in 1940, or that it is expected to be in 1941. In fact, it has suffered a huge annual net deficit every year since 1927, and during certain years prior to that time.

It is interesting to note that in 1929, when 525,000,000 tons of coal were produced and sold, the industry as a whole suffered a net deficit of \$11,822,033, as shown by income tax reports. In 1928, when the mines produced 501,000,000 tons, the industry suffered a net deficit of \$24,508,330. In 1925, when the production was 520,000,000 tons, the net deficit was \$22,363,497. As previously stated, it is estimated that the production for 1941 will approximate 500,000,000 tons.

Effects of "Distress" Coal Reduced

In studying present market conditions, it should be noted that even in 1941, when the demand for coal had increased substantially over 1940, producers still were confronted with the problem of marketing "distress" coal. However, the minimum prices and marketing rules have reduced the effects of such coal on the market to relative unimportance.

"Distress" coal is a term generally used to mean coal which cannot be sold at the prevailing market price (before minimum prices were established) or at the effective minimum price, but which must be disposed of by the producer to prevent shutting down the mine

because mine sidetracks have become blocked by cars loaded with the unsold coal.

The accumulation of "distress" coal is caused by the peculiar way in which mining operations are carried on. Coal generally is sold according to size, and when a particular size is manufactured, other "resultant" sizes also must be made. Thus, to make lump and other prepared sizes, the smaller particles of coal, which are removed (by screening), are resultant sizes which also must be marketed. Hundreds of different size combinations are made by the industry in marketing its coal.

Market for Sizes Not Balanced

The demand for particular sizes of coal may temporarily be such as will not permit them to be sold except at low prices, while at the same time a mine may be enjoying a good market for other sizes which are produced in the normal operation of the mine. Thus, in the summer, a mine may be able to sell readily its small-sized coals, such as those used by industry for steam generation, but it may find the market dull for the lump sizes used for home heating.

Often, the slow-selling sizes accumulate in such quantity that the mine railway sidetracks become blocked by railway cars loaded with the slow-selling sizes, and these cars must be moved if the mine is to continue loading the sizes which it can readily sell. Generally, the industry is not prepared to store the unsalable sizes other than in railway cars. If the mine is not shut down, the producer must dispose of the "distress" coal quickly at the best price he can get. Shut-downs may be extremely costly to a producer, and usually may be prevented by the sacrificed sale of a few cars of coal.

"Distress" Coal a Problem

Prior to the establishment of minimum prices the dumping of "distress" coal onto the market at sacrifice prices was one of the coal industry's constant problems. It was common for coal purchasers to shop for bargains in "distress" coal to meet their normal requirements and therefore refuse to buy coal at ordinary market prices. Also, it was common for large purchasers to use the availability of "distress" coal as a means of forcing producers to cut prices on other coals which were not in "distress."

The devastating effect of such a condition is obvious, particularly when large-quantity buyers present a solid front to the unorganized coal producers under demoralized marketing conditions. Because of general conditions in the industry prior to the establishment of minimum prices producers usually were ready to cut prices, regardless of the consequences, to hold business, or gain additional tonnage.

Although "distress" coal has been a disturbing element in the coal markets, when sold in an indiscriminate manner, such as it was before minimum prices were established, it actually comprises a small amount of the total production.

Problem Now Under Control

Under the minimum prices and marketing rules, "distress" coal is now being eased into the market under such conditions that its effect upon market prices is insignificant. The Division permits it to be "substituted" on orders for cheaper coals if the purchaser is willing to accept it and if it can be sold under conditions whereby the market will not suffer. In all such transactions, except where the coal is "substituted" on railway locomotive fuel orders, an official permit must be obtained from the Division before the coal is shipped. In the case of railway locomotive fuel, as a general rule such permits do not have to be obtained prior to shipment.

The following figures will show the amount of "distress" coal for which the Division has issued "substitution" permits in transactions, other than railway locomotive fuel, since minimum prices were established:

	<i>Tons</i>
October 1940.....	253, 370
November 1940.....	225, 591
December 1940.....	86, 420
January 1941.....	77, 630
February 1941.....	45, 600
March 1941.....	40, 915
April 1941 (mines closed by strike).....	3, 800
May 1941.....	25, 200

Action on Permits Speeded

The Division has instituted a system whereby requests for "substitution" permits may be cleared by telegraph or teletype as a means of protecting producers against possible costly delays. To obtain a permit, a producer must certify that the "substitution" is necessary to prevent the mine from being shut down because railway sidings have been blocked by cars loaded with coal which cannot be sold at the effective minimum prices.

Each application for a permit is investigated, and for this purpose the Division has available a vast amount of statistics showing the requirements of the various consumers and their coal-purchasing history. This material is arranged so that such investigations may be speedily conducted, and the applications for permits can be acted upon in a matter of hours.

In addition to relieving the markets of the effect of "distress" coal, the method provided for handling this problem under the Coal Act also enables the producers to get much better prices for it than in the past. Instances where "distress" coals produced in an area with an average cost of production of \$2.13 per ton were sold for as little as 50 cents or so per net ton were not uncommon prior to minimum prices. The prices generally were far below cost. Now, the price for "distress" coal may not be less than the effective minimum prices for the size of coal for which it is being "substituted."

Need for Continued Stabilization

Even though since October 1, 1940, much coal has been sold above the minimum prices, producers still are confronted by the problem of "distress" coal. This and other factors indicate the need for continued market stabilization by the Government. Violations involving the sale of coal at market prices lower than the effective minimum prices continue to occur. Also, producers continue to ask the Division for revisions in the minimum price schedules which involve lowering or raising minimum prices for particular coals because of competitive conditions. (Compliance with and adjustment of the minimum prices will be covered in another section of this report.)

Substantially All Coal Now Protected

The minimum prices and marketing rules and regulations apply to the sale of substantially all of the bituminous coal produced in the United States. Under the Coal Act, producers may become members of the Bituminous Coal Code, and thus cooperate in the market stabilization program, or they may remain outside the code and sell their coal at whatever prices they wish, subject to a 19½ percent tax on their sales price.

As of June 21, 1941, there were 14,697 producers who were members of the Bituminous Coal Code. They produce substantially all of the commercial coal in the United States. Although there are approximately 800 known coal producers outside the code, their production is extremely small and comprises a negligible portion of the Nation's total.

Coal Industry Cooperates

The Division has had excellent cooperation from the whole coal industry, including both producers and representatives of the mine employees, in administering of the Coal Act.

The Bituminous Coal Producers' Boards for the various districts have been particularly cooperative. Board representatives constantly

participate in the proceedings leading to the establishment of minimum prices and marketing rules and regulations. They also have been active in the minimum price and marketing rule adjustment proceedings and other matters since then. In compliance matters, most of the boards have set up special machinery for cooperation with the Division.

In addition to this, the boards have maintained a joint committee for consultation and advice from time to time on matters concerning their relation with the Division.

Under the provisions of the Coal Act, producers elect all members except one on each board. The one member is the designated representative of the mine employees of the district. The board members are elected for 2-year terms. Elections to fill expiring terms were held during the week of June 2, 1941. A mine employees' representative for each district has also been designated.

Industry Advisory Committee Named

On January 30, 1941, Secretary Ickes announced the appointment of an Advisory Committee to the Bituminous Coal Division. This committee is comprised of representatives of coal producers and representatives of coal-mine employees. The order of the Secretary of the Interior designating it, provided that the committee's functions "shall be to advise the Director of the Bituminous Coal Division and the Secretary of the Interior on matters of general policy arising in connection with the administration of the Bituminous Coal Act of 1937."

3. The Establishment of Minimum Prices

The formulation of minimum price schedules and marketing rules was a highly intricate and technical task, most of the details of which have been described in previous annual reports to Congress. The work required a great amount of time and a tremendous amount of work by a large force of highly skilled technicians.

Although the Bituminous Coal Act became a law in the spring of 1937, it was not practicable for Congress to provide detailed schedules containing minimum prices for each kind, quality, and size of coal which each of the approximately 15,000 code members produce and ship into the various markets they serve. The administrative agency was required to perform this task under the standards and procedure provided by Congress.

The Bituminous Coal Division of the Department of the Interior began administration of the Coal Act of July 1, 1939, under terms of the Reorganization Act of 1939 and Executive orders relating thereto.

Prior to that time, the Coal Act had been administered by the National Bituminous Coal Commission, which was abolished under the reorganization act.

The work of establishing minimum prices and marketing rules originally was begun by the former Commission. In taking up the Commission's functions, the Division salvaged as much of its work on minimum prices and marketing rules as possible, and, building upon them, it completed the task.

Full Hearings Held

The minimum prices and marketing rules were established after full hearings for all concerned, which, together with the complex nature of the task, required a great deal of time. The old Coal Commission had opened final hearings on minimum prices in May 1939. These were interrupted during the transition of the administration of the Coal Act from the Commission to the Bituminous Coal Division, but on July 24, 1939, they were resumed. These hearings lasted until January 20, 1940. (An account of these hearings will be found in the third annual report under the Bituminous Coal Act of 1937, which covers the fiscal year ending June 30, 1939, and the section of the annual report of the Secretary of the Interior, 1940, containing the Coal Division's report for the fiscal year ending June 30, 1940 (U. S. Government Printing Office, Washington). The examiners completed filing their report with the Director of the Division on April 13, 1940. Oral arguments on exceptions to the examiners' report were heard by the Director from May 27 to June 6, 1940.

After making findings of fact and conclusions of law, the Director, on August 8, 1940, issued an order establishing minimum prices as set forth in the schedules which had been mailed to appropriate persons. By the terms of the order, these minimum prices, together with marketing rules and regulations and the schedule of common consuming market areas, were to become effective on September 3, 1940, subject to revision by the Secretary of the Interior.

Director's Orders Reviewed by Secretary

A period of 10 days from the date of issuance of the Director's order was afforded interested parties for the filing of exceptions and requests for review with the Secretary of the Interior. Several parties filed requests for extension of time. The Secretary extended this period to August 30, 1940. In view of this action, the Director postponed the effective date of minimum prices and marketing rules and regulations until October 1, 1940.

Exceptions to the Director's findings of fact and conclusions of law were filed with the Secretary by more than 100 parties. Several re-

quests for a review of certain phases of the findings and conclusions, and for other relief, were also filed.

The Secretary passed upon the exceptions and requests for review prior to October 1, 1940, and upon that date the minimum prices and marketing rules and regulations became effective.

4. Regulation of Sales Outlets

In general, the practices in the coal industry which led to passage of the Coal Act were centered in its marketing activities. It follows, then, that the regulation of the industry's sales channels is one of the highly important phases of the administration of the Coal Act.

It must be borne in mind that regulation of marketing activities must be done in such a way as to assure not only compliance with the law, but also the free movement of coal in interstate commerce.

In the preamble of the Coal Act, Congress stated that "there exist practices and methods of distribution and marketing of such coal that waste the coal resources of the Nation and disorganize, burden, and obstruct interstate commerce in bituminous coal, with the result that regulation of the prices thereof and of the unfair methods of competition therein is necessary to promote interstate commerce in bituminous coal and to remove burdens and obstructions therefrom."

Principal Marketing Channels

For a long time, it has been the practice of the industry to use three principal channels in marketing its coal. They are:

1. Direct selling, where the coal is sold directly to the customer by the producer's own selling department or organization, which may consist only of himself, or of any number of salesmen.

2. Sales agencies, where the producer appoints one or more sales agents to sell his coal on a commission or salary basis; or regional marketing agencies, owned and operated by code member producers.

3. Distributors, where the producer sells the coal at a discount from the prevailing price to a distributor or wholesaler, who resells it to the customer or ultimate user.

Any one or more of these channels may be employed by a single producer. Not infrequently a sales agent sells the coal to a distributor at a discount, and often the services of subagents are utilized by the sales agent. Thus, coal sometimes passes through the hands of two or more middlemen. The additional sales cost increases the price to the ultimate consumer and reduces the net income of the producer.

Pyramiding of Commissions and Discounts

The intense, destructive competition between selling units was one of the principal factors which kept coal prices below the industry's cost

of production and contributed to the general demoralization of the industry. Selling units, hungry for commissions, strove to capture as much of the available coal business as possible. Producers who had their own sales forces were equally prone to cut prices, even below their own costs, to get business. Price cutting plus the pyramiding of the sales commissions and discounts contributed largely to the impoverishment of the industry and to the chaos which resulted.

Long before the Coal Act was passed, producers tried to solve the marketing problem. They experimented in some instances with regional marketing agencies, in the hope of minimizing sales cost and providing orderly distribution of their coal. But, the antitrust laws and the impracticability of voluntary cooperation in face of the demoralized conditions in the industry proved to be tremendous hurdles, and the coal industry, in general, came to realize that direct market stabilization by the United States Government was the only practicable solution to its problem.

Direct Regulation Provided

In the Bituminous Coal Act of 1937, Congress sought to provide basic stabilization for the industry by eliminating destructive price cutting through the establishment by the Government of minimum prices to maintain a "cost floor" at the mine; by controlling the marketing and sale of coal through the establishment of marketing rules and regulations, and by outlawing unfair trade practices.

The law provides for the direct regulation of the various sales channels, in the interest of assuring compliance with minimum prices and regulations and effectuating the purposes of the Coal Act.

While recognizing that direct regulation by the Government of the marketing practices was necessary, Congress also found it advisable to provide a way for producers to continue to utilize regional marketing agency devices. It empowered the Coal Division to approve and regulate marketing agencies, subject to conditions consistent with purposes of the Coal Act, which provided against the possibility of such agencies being operated against the public interest.

All Sales Channels Covered

Specific provisions of the coal act recognize the necessity for appropriate regulation of all channels of distribution.

Employment of any person or appointment of any sales agent, at a compensation obviously disproportionate to the ordinary value of the services rendered, and whose employment or appointment is made with the primary intention and purpose of securing preferment with a purchaser is declared by the act to be an unfair method of competition,

and constitutes a violation. Also, the act requires the Division to prescribe due and reasonable maximum discounts or allowances which code member producers may allow from the minimum prices in selling coal to distributors and legitimate, bona fide farmers' cooperative organizations.

The law provides that the minimum prices must give the industry an average income, equal as nearly as may be to its average cost, including such selling costs. And so these selling costs affect directly the minimum price levels, and the higher the selling cost the higher is the level of the minimum prices.

In addition to the regulations covering direct sales by code members, the Division has taken appropriate measures concerning sales agents, subagents, distributors, farmers' cooperative organizations, and regional marketing agencies. These measures are discussed in the following paragraphs.

Regulation of Sales Agents

Under the marketing rules and regulations, all the terms and conditions of sales agency agreements between code member producers and their sales agents must be set forth in a written contract, which in turn must be filed with the Division. The same is required of subagency contracts. These contracts must cover, among other things, the amount of or the basis for the commission to be paid by the producer and an agreement by the sales agent or subagent to maintain and observe the minimum prices and marketing rules and regulations in the sale of the producer's coal.

As of June 30, 1941, 3,679 sales-agency contracts had been filed with the Division by 2,060 producers. These contracts were divided among 925 sales agents. In addition there were on file 2,450 subsales agents' contracts, which were divided among 479 subagents.

After the Division had prescribed maximum discounts for sales to distributors, it was noted that some persons who formerly acted in the capacity of distributors entered into sales agency agreements with certain producers whereby the compensation which they would receive as sales agents would exceed the amount of the discounts which they are allowed as registered distributors.

New Precautions Taken

The Division, thereupon, caused a hearing to be held in the matter (General Docket 20), as a means of taking proper precautions against the possibility of producers and distributors evading the minimum prices and marketing rules by changing the designation of a distributor's business to that of a sales agent without the distributor's

accepting, however, the responsibilities and functions of a sales agent. As a result of this hearing, a marketing rule was promulgated prohibiting code members from paying sales agents appointed after August 8, 1940 (the date upon which the Director's order establishing minimum prices was issued), commissions in excess of the maximum discounts which could be allowed if the coal were to be sold through distributor instead, unless specific approval for payment of the higher commission was given by the Division.

Since the promulgation of this rule, 1,260 persons had applied for approval of sales agency contracts entered into by them after August 8, 1940, as of the end of the fiscal year. To date, approval has been granted to 789 of them.

Regulation of Distributors

Maximum distributors' discounts or allowances from the minimum prices have been prescribed by the Division, and rules and regulations have been established requiring distributors to maintain and observe minimum prices and marketing rules and regulations in the resale of coal. Producers may sell coal at a discount from the established minimum prices to distributors only when the distributors are registered by the Division. As a condition of registration, a distributor must be a bona fide merchant, actively, regularly, and continuously engaged in the wholesale coal business, and must agree that he will maintain and observe the minimum prices and marketing rules and regulations in the resale of all coal purchased by him. He also must agree not to accept or retain a discount in the resale of coal in less than railroad carload or ship-cargo lots. He may not receive a discount (1) when he physically handles the coal, except where the coal is handled over a dock or (2) when he delivers the coal to the consumer in transportation facilities which he owns or otherwise controls. Registration authorizes code members to allow discounts to registered distributors on proper transactions without further approval by the Division.

Persons who are not actively, regularly, and continuously engaged in the wholesale coal business may, however, receive discounts from the minimum prices on coal purchased and resold by them in proper transactions, upon specific approval by the Division.

As of June 30, 1941, there were 1,954 persons registered by the Division as distributors, and two persons not registered made applications for and had been granted permission to receive discounts on specified transactions.

Distributors Ordered To Show Cause

On May 26, 1941, a proceeding was instituted in Docket 1695-FD, directing some 419 distributors to show cause why their registration

should not be revoked on the ground that they are not actively, regularly, and continuously engaged in the business of purchasing coal for resale and reselling it in not less than cargo or railroad carload lots within the meaning of Section 304.13 of the Rules and Regulations for the Registration of Distributors. Such persons were required to answer on or before June 20, 1941, and were afforded an opportunity to be heard before a division trial examiner on June 26, 1941.

The proceedings against 111 of these distributors were dismissed upon a proper showing that they were qualified for registration. Of the remainder, 182 answered the citation and 32 appeared at the hearing on June 26. This hearing was kept open until July 14, 1941, to afford persons who requested hearing at a later date an opportunity to be heard. All answers filed by respondents whether or not they appeared at the hearing have been incorporated into the record for the consideration of the examiner.

Farmers' Cooperatives Registered

The marketing rules and regulations provide, as does the coal act, that discounts from the minimum prices may also be allowed to bona fide and legitimate farmers' cooperative organizations duly organized under the laws of any State, the District of Columbia, or the United States. The Division has prescribed applicable maximum discounts. As of June 30, 1941, there were 24 farmers' cooperative organizations which had been approved by the Division as qualifying for such discounts.

Regional Marketing Agencies

The coal act provides for the establishment, subject to the Coal Division's approval and regulation, of regional marketing agencies composed of and controlled by code member producers for the purpose of marketing their coals through a common agency. Membership is on a voluntary basis. These agencies are permitted to fix the market prices for their members' coals. Neither the agencies nor their members may sell coal below the minimum prices established by the Division or above any maximum prices which the Division might establish.

The coal act exempts such agencies from the provisions of the Sherman Anti-Trust Act, but makes them subject to close regulation by the Division in order to protect coal consumers from unreasonable prices or restrictions of the coal supply and any other practices contrary to the public interest.

Provisional approval has been granted to 14 regional marketing agencies, organized in various parts of the United States.

Marketing Agencies Listed

Following is a list of the agencies whose applications have been provisionally approved, the date of such approval, and the fields in which the mines of agency members' mines are located:

Agency name	Date provisional approval granted	Location of members' mines
Alabama Coals, Inc., Birmingham, Ala.	Sept. 22, 1937	Alabama.
Appalachian Coals, Inc., Cincinnati, Ohio.	do	West Virginia, Kentucky, Virginia, and Tennessee.
Arkansas-Oklahoma Smokeless Coals, Inc., Fort Smith, Ark.	May 1, 1939	Arkansas-Oklahoma.
Belleville Fuels, Inc., Terre Haute, Ind.	Jan. 9, 1940	Belleville, Ill., field.
Brazil Block Fuels, Inc., Terre Haute, Ind.	Jan. 10, 1940	Brazil Block field, Ind.
Fairmont Coals, Inc., Fairmont, W. Va.	Jan. 5, 1939	Northern West Virginia.
Indiana Coals Corporation, Terre Haute, Ind.	May 27, 1941	Indiana (except Brazil block).
Kentucky Coal Agency, Inc., Madisonville, Ky.	Nov. 29, 1938	Western Kentucky.
Middle States Fuels, Inc., Terre Haute, Ind.	Oct. 17, 1938	Fulton-Peoria, Ill., field.
Smokeless Coal Corporation, Charleston, W. Va.	Sept. 22, 1937	Southern West Virginia "smokeless."
Southern Illinois Coals, Inc., Chicago, Ill.	Nov. 29, 1939	Southern Illinois.
Southwest Coal Co., Kansas City, Mo.	June 28, 1939	Kansas-Missouri.
Upper Buchanan Smokeless Coal, Inc., Wilmington, Del.	Sept. 20, 1939	Virginia.
Western Pennsylvania Coal Corporation, Pittsburgh, Pa.	Dec. 21, 1938	Western Pennsylvania.

New Safeguards Considered

At the close of the fiscal year, the Division was considering the institution of proceedings to tighten its regulations governing regional marketing agencies and the setting up of machinery for the establishment of maximum prices for coal sold by such agencies whenever such a step became necessary for the protection of the public interests. (During the months of July and August 1941, the Director ordered marketing agencies heretofore provisionally approved to show cause why their provisional approvals should not be modified by adding certain conditions to these orders of approval. Hearings on these orders were commenced in August.)

In connection with the provisional approval of some of the most recently authorized agencies, the Division already has announced the adoption of additional safeguards for the protection of coal consumers in the exercise of price-fixing powers by these agencies.

5. Adjustment of Minimum Prices and Marketing Rules

The minimum prices promulgated by the Bituminous Coal Division comprise an intricate, dynamic structure, characterized by continual change. Such a structure must be kept constantly in tune with the \$2,500,000,000 coal-producing industry and its vicissitudes, if it is to maintain stable marketing conditions, keep unobstructed the channels of everyday commerce, and aid the functioning of this industry as the major source of the Nation's fuel and power.

The law requires that minimum prices reflect, as nearly as possible, the relative market values, at points of delivery in each common consuming market area, of the various kinds, qualities, and sizes of coal produced in the mines of the approximately 15,000 code-member producers. Also, they must take into account values as to uses, seasonal demand, transportation methods and charges, and their effect upon a reasonable opportunity to compete on a fair basis; the competitive relationships between coal and other forms of fuel and energy, and must preserve, as nearly as may be, existing fair competitive opportunities.

Industry's Scope Wide

In measuring the task of keeping the minimum-price structure properly adjusted, a brief picture of the scope of the industry will be helpful. The mines of the 15,000 code members are located in more than 25 States. They employ approximately 500,000 workers, and their production totals from 350,000,000 tons to 500,000,000 tons per year. This coal is shipped into approximately 200 "common consuming-market areas" which cover every State in the Union and Canada. It comprises approximately one-third of the revenue-originating freight carried by the railroads. Hundreds of thousands of freight rates are involved in its transportation. In 1936, experts of the United States Bureau of Mines issued a statement saying that the annual value of the bituminous coal produced in the five largest coal-producing States exceeds that of the entire national output of gold, silver, copper, lead, and zinc, with aluminum thrown in for good measure.

Industry Conditions Constantly Change

Operating and competitive conditions within this industry are constantly changing. New developments of both scientific and economic nature are frequent. As such changes occur, it becomes necessary appropriately to revise or supplement the effective minimum-price schedules and marketing rules and regulations, and the cost of production determinations upon which minimum prices are predicated in order to comply with the standards of the Coal Act and to prevent a recurrence of chaos and distress, through a break-down of the price structure.

For example, the opening of a new mine by a code member necessitates establishing additional minimum prices for its coals, lest it be allowed to operate free of regulation in competition with coals subject to minimum prices. Again a variation in the geological nature of the seam of coal being worked by a mine for which minimum prices

already have been established, or a variation in its method of mining or in its preparation facilities, may so change the nature and the worth of its coal as to necessitate a revision of the established applicable minimum prices. Such a revision might be necessary either for the protection of that producer's fair competitive opportunities or for the protection of those of his competitors.

A change in freight rates or in the facilities for shipment of coal by railroad, by inland waterways, by ocean or Great Lakes vessels, or a change in the conditions of the highways from mine to market affecting motor truck transportation, may so affect the competitive factors bearing on the distribution of coal as to require modification of the minimum-price schedules.

As stated, the Coal Act requires that the minimum-price structure shall take into account competitive relationships between coal and other forms of fuel and energy. Thus, developments affecting the competition of coal with other forms of fuel and energy may also necessitate modification of the established price structure.

And, also, whenever a change in excess of 2 cents or more per net ton in the production costs for any of the various minimum-price areas occurs, a procedure is prescribed in the act for making appropriate modifications in the levels of the minimum prices for affected areas.

Congress Foresaw Situation

Congress expressly provided for the adjustment of the price structure in section 4 II (d) of the Coal Act, authorizing the filing with the Division of petitions seeking modification of the effective minimum-price schedules or marketing rules and regulations. Code members, district boards, Consumers Counsel, and Governmental subdivisions have freely availed themselves of the privilege of petition thereby conferred upon them.

Hearings are required to be held in these matters (unless waived by the parties), and they are held either before trial examiners or the Director of the Division. In each hearing, the Office of the General Counsel has participated, in the interest of assuring the development of a full and complete record. In such hearings, the assistance of the Marketing Branch and of the Economics Branch, in preparing statistical exhibits, is frequently invoked, either by the Division or, as provided by the rules, by parties. To the extent feasible in the light of available funds and personnel, the Division's facilities for collecting and compiling statistical data is made available for use in these proceedings.

The volume of business which the Division has handled under section 4 II (d), in addition to its other work, is quite large.

944 Petitions Filed

As of July 1, 1941, there had been 944 petitions filed under section 4 II (d) of the Coal Act, seeking either supplementation or revision of effective minimum-price schedules and marketing rules and regulations.

Of this total, 424 were filed by persons seeking the establishment of new minimum prices and new price classifications, either for coal produced by new mines or new types or sizes of coal produced by old mines.

In 512 of the total number of cases filed, adjustments of the established minimum prices were sought. In addition, five petitions requested changes in the marketing rules and regulations.

Such petitions are disposed of as expeditiously as possible, and where it is requested and the necessity for it is shown, temporary relief is granted to a petitioner while final decision on the matter is pending.

Petitions Cover Many Mines

A single petition may involve one or several mines and one or several market areas. For instance, the 424 petitions seeking the establishment of new minimum prices involved more than 5,000 individual mines, located in every coal district in the United States. They sought the establishment of minimum prices for truck shipments from more than 4,800 mines and for rail shipments from more than 800 mines. They also requested the establishment of additional minimum prices covering rail and river shipments for nearly 1,000 mines which had previously shipped only by truck.

River Coal Problems

One of the more controversial problems incidental to the administration of the Coal Act, which has arisen from time to time in minimum price adjustment proceedings under section 4 II (d), involves the method used by the Division in pricing river-transported coal in relation to coal transported by railroad or other means. It has been argued that the method used by the Division does not permit consumers served by inland waterways to enjoy the savings said to accrue from cheaper water transportation charges.

The amount of coal shipped by river barges is substantial. It is shipped from mines in Pennsylvania, Ohio, West Virginia, Kentucky, and Illinois, via such rivers as the Ohio, Allegheny, Monongahela, Muskingum, Kanawha, the Illinois, and the Mississippi.

Issue Taken With Certain Prices

In general, no serious objections have been raised regarding the minimum prices established for coal shipped to consumers directly

located on the river, generally referred to as coal shipped for "free alongside delivery." However, in some instances, issue has been taken with the minimum prices established for coals shipped via barge to a river port and thence via rail or truck to consumers at inland destinations. This is generally termed "ex-river" shipment.

Generally speaking, the minimum price schedules provide the same minimum price at the mine for coals shipped via barge for "free alongside" delivery to consumers directly on the rivers as they do for comparable coal shipped "all rail" to the same destination. Therefore, to the extent that cheaper water transportation charges gave shippers of river coal a competitive advantage in the past over "all rail" shippers of comparable coal, a competitive advantage and hence a savings to the consumer often resulted.

"Ex-River" Situation

However, in the case of "ex-river" shipments, it was found that before minimum prices were established, coal shipped "all rail" generally maintained either a competitive advantage or a substantially equal competitive status against coal shipped to the same point via "ex-river." This was due to various circumstances such as: transportation cost for the "ex-river" shipments approximated or exceeded the cost of rail transportation; or, where river transportation cost was lower, rail shippers reduced their mine prices sufficiently to offset the adverse transportation differential which otherwise would give the river shippers a competitive advantage. As a consequence, both rail and river shippers were able to and did sell comparable coal in important "ex-river" markets at about a delivered price parity.

In approaching the task of establishing minimum prices at the mines for shipments to these "ex-river" markets, the Coal Division had to be guided by two standards specifically prescribed in the Coal Act:

(1) That the existing fair competitive opportunities should be preserved:

(2) That transportation methods and charges, and their effect upon the reasonable opportunity to compete on a fair basis, should be taken into account.

Accordingly, where it appeared that substantial competition between "ex-river" and all-rail" shippers had existed in the past, the Division established minimum prices at the mines which, when added to the respective transportation charges, would yield equalized minimum delivered prices at "ex-river" destinations.

This method has been attacked on the ground that the minimum price at the mine should be the same regardless of the method of transportation employed, in the interest of passing on to the consumers such savings as may be effected through the use of river transportation.

The Division's method was considered to be fundamentally necessary in order to comply with the requirement that the competitive opportunities of both "all-rail" and "ex-river" shippers be preserved.

Exceptions Provided For

However, the Division recognized that exceptions to this method of pricing "ex-river" coal are appropriate in those instances where such coals in the past had a competitive advantage over "all-rail" coal and wherein consumers at "ex-river" destinations had actually enjoyed the savings accruing from the use of river transportation. Special machinery is provided in the price schedules to cover such situations. Thus, any code member, or the Consumers' Counsel, on behalf of any consumer or retail dealer, may petition the Division for the establishment of minimum mine prices for "free alongside" delivery, in lieu of the applicable price for "ex-river" delivery to "ex-river" consumers allegedly qualifying within the exception. In several instances this machinery has already been successfully invoked on behalf of "ex-river" consumers.

Similarly, provision is made to permit consumers and retail dealers to take advantage of future developments, such as the improvement of inland waterways, location of new plants or facilities on the river, or changes in the cost of river transportation, of such a nature as to warrant the extension of competitive advantages attributable to the use of river transportation in light of all the pertinent facts. In such cases, also, a code member or Consumers' Counsel may initiate proceedings for appropriate price changes.

Since the promulgation of the effective minimum prices, only 18 petitions have been filed asking for the establishment of minimum prices for "free alongside" delivery. As of June 30, 1941, temporary or final relief had been granted in 10 of these cases. Relief has been denied in three and five others were still pending.

(On July 29, 1941, the Director issued an order of temporary relief granting District 10 (Illinois) code member producers minimum prices for "free alongside" shipments, via barge, to retail dealers at Minneapolis and St. Paul. (Docket No. 780.) The matter was taken under consideration for final disposition.)

River Shipments Increasing

The Division's method of handling the river-rail problem did not result in any decrease in river shipments. During the last 3 months of 1940, when minimum prices were in effect, river shipments totaled 9,261,231 tons, as compared with a total of 8,202,428 tons during the last 3 months of 1939. "Ex-river" shipments during the last 3

months of 1940 totaled 1,195,848 tons, as compared with 991,945 tons during the last 3 months of 1939.

These statistics disclose a 12.9 percent increase in river shipments during the last 3 months of 1940 as compared with those months in 1939, and a 20.6 percent increase in the "ex-river" shipments during the same period.

Special Dock Prices Considered

On May 5, 1941, the Division announced that it was considering the institution of proceedings for the purpose of establishing more definite minimum prices for coal sold off the Upper Great Lakes docks, and called upon interested persons to submit such suggestions and proposals as they deemed pertinent.

The Division has since asked the dock operators to furnish certain information concerning their dock operations costs for the Division's use in connection with this matter, and to assist in the preparation and promulgation of such schedules, rules, regulations, and orders as may prove necessary.

Only Formula Now Provided

At the present, the minimum price schedules provide minimum prices "at the mines" for the Great Lakes dock coals and a formula by which dock operating distributors are to compute their minimum prices "at the docks." This is done by each dock operator adding the actual intervening transportation and handling costs to the applicable minimum prices "at the mine." Because of variations from dock to dock in such intervening costs and the variations also in the accounting methods by which these costs are computed, the Division believes that steps should be taken to assure the greater effectiveness of the applicable minimum mine prices for coal sold over the docks.

Coal is shipped to the Great Lakes docks from mines in the Appalachian region, via a combination of rail and Great Lakes vessel movement, during the navigation season. It is stored on the docks for year-around use, and is reshipped as needed by rail, truck, or barge to inland points of consumption in Wisconsin, Minnesota, and nearby territory. "Ex-dock" coal is sold in these inland points in competition with coal shipped "all-rail" from mines in the Midwest, Southwest, and the Appalachian region.

Prior to the initiation of any formal proceedings looking toward the establishment of the special schedules, due and adequate public notice will be given to all interested parties in order that they may have a full opportunity to appear and be heard.

Cost Adjustment Proceeding

The Bituminous Coal Act requires that whenever the weighted average cost of producing coal for any minimum price area is found to have changed in excess of two cents per net ton, the minimum prices for that area shall be changed accordingly.

In May 1941, after minimum prices had been in effect for about 7 months, the Division instituted a general proceeding (General Docket 21) for the purpose of ascertaining what changes, if any, had occurred in the costs of producing coal, and for the purpose of making appropriate adjustments in the minimum prices if changes were found to be necessary.

As of June 30, 1941, some 70 parties had appeared in General Docket 21, including the Consumers' Counsel, all of the Bituminous Coal Producers' Boards and many code members and consumers or consumer groups.

At the commencement of this proceeding, the Division introduced in evidence tabulations showing the weighted average costs for all districts and minimum price areas for the years of 1938, 1939, and 1940, as compared with the cost figures determined in General Docket No. 15 and used as the base for the minimum prices now in effect.

Table Shows Cost Comparisons

The accompanying table contains a summary of the tabulations introduced into the record in General Docket No. 21 by the Division. (Also shown are the weighted average costs used in the establishment of minimum prices now in effect.)

TABLE 2.—Weighted average costs during calendar years 1938, 1939, and 1940,¹ compared with base determined in general docket No. 15 of all mines, both over and under 50-ton daily capacity, including all adjustments ²

District and minimum price area	Weighted average ³ costs used in establishing minimum prices now in effect	Weighted average cost per ton for years—		
		1938	1939	1940 ⁴
Price Area 1:				
District 1—Central Pennsylvania, Maryland and part of northern West Virginia.....	\$2.3887	\$2.3077	\$2.1954	\$2.1343
District 2—Western Pennsylvania.....	2.2140	2.2582	2.0794	1.9852
District 3—Northern West Virginia.....	1.8366	1.7823	1.7187	1.6517
District 4—Ohio.....	1.9356	1.9045	1.7620	1.7131
District 5—Michigan.....	3.6543	3.9044	3.8438	3.8963
District 6—West Virginia "Panhandle".....	1.9775	1.8554	1.6620	1.6248
District 7—Southern West Virginia and Virginia "Smokeless".....	2.1940	2.2267	2.0823	2.0345
District 8—Southern West Virginia, East Kentucky, part of Virginia and Tennessee.....	2.0301	2.0444	1.9491	1.9026
Total.....	2.1284	2.1253	2.0000	1.9429

See footnotes at end of table.

TABLE 2.—Weighted average costs during calendar years 1938, 1939, and 1940,¹ compared with base determined in general docket No. 15 of all mines, both over and under 50-ton daily capacity, including all adjustments²—Continued

District and minimum price area	Weighted average ³ costs used in establishing minimum prices now in effect	Weighted average cost per ton for years—		
		1938	1939	1940 ⁴
Price Area 2:				
District 9—West Kentucky.....	\$1. 5805	\$1. 4807	\$1. 4131	\$1. 4020
District 10—Illinois.....	1. 7561	1. 7185	1. 6246	1. 5851
District 11—Indiana.....	1. 6525	1. 5844	1. 4366	1. 4229
District 12—Iowa.....	2. 7636	2. 6301	2. 4731	2. 4200
Total.....	1. 7622	1. 6982	1. 5838	1. 5588
Price Area 3:				
District 13—Alabama.....	2. 4382	2. 4205	2. 3499	2. 3122
Price Area 4:				
District 14—Arkansas-Oklahoma.....	3. 6080	3. 4087	3. 3293	3. 2874
Price Area 5:				
District 15—Missouri-Kansas-Oklahoma field.....	2. 0392	1. 9387	1. 8550	1. 8366
Price Area 6:				
District 16—Northern Colorado.....	2. 5559	2. 5430	2. 5374	2. 3630
District 17—Western and Southern Colorado, Northern New Mexico.....	2. 7664	2. 7637	2. 6035	2. 5041
District 18—Arizona-New Mexico.....	3. 1519	3. 1321	3. 2904	3. 3246
Total.....	2. 7389	2. 7214	2. 6318	2. 5166
Price Area 7:				
District 19—Wyoming, Idaho.....	1. 9917	1. 8994	1. 8681	1. 8237
District 20—Utah.....	2. 4691	2. 2011	1. 9848	2. 0082
Total.....	2. 1691	2. 0096	1. 9099	1. 8924
Price Area 9: District 22—Montana.....	1. 4851	1. 4930	1. 3585	1. 3370
Price Area 10: District 23—Washington, Oregon.....	3. 2247	3. 1652	3. 0498	3. 0885
Total, United States.....	2. 0884	2. 0638	1. 9438	1. 9002

¹ These figures are taken from exhibits introduced in evidence by the Division in the proceeding (designated General Docket No. 21) being held for the purpose of determining whether there have been such changes in the weighted average costs of production within prescribed minimum price areas as to require changes to be made in the effective minimum prices. No ruling has been made by the Director on these figures.

² Total ascertainable tonnage used as divisor for total amount of producing, administrative and selling cost.

³ Based upon 1936 data, with consideration of costs during the last nine months of 1937 and other adjustments as per findings of facts.

⁴ Preliminary.

New Wage Rates

It was anticipated that during the course of this proceeding, there also would be shown the effect of the changes in labor costs occasioned by the 1941 wage negotiations in the industry. To facilitate the accumulation of data for this purpose, the Division on May 12, 1941, dispatched to all producers a questionnaire regarding the effects of wage changes on costs of operation, which were to be placed in convenient form by the Division for use in connection with the hearing.

6. Compliance

In general, compliance with the minimum prices and marketing rules and regulations and the other orders of the Division has been satisfactory.

Although complaints are constantly being filed charging producers with violations, and in addition numerous proceedings have been instituted to determine whether violations have been committed by registered distributors, by comparison with the tremendous volume of business done by the industry the scope and frequency of these cases are relatively small.

However, it must be kept in mind that the improved market conditions resulting from the defense program, no doubt has made the test of compliance much less severe than if more normal conditions had prevailed. The expanding demand for coal has lessened, somewhat, the incentive which some producers might otherwise have had to sell their coal without regard to minimum prices and marketing rules and regulations.

Burden Upon Staff Large

Though the number of violations to date has been relatively small, compliance cases comprise no mean portion of the burden of work upon the Division's staff. Even though the Division has organized as large a compliance force as possible, in view of all of its functions, it has been unable for budgetary reasons to handle compliance cases as expeditiously as is deemed necessary for most effective enforcement, or certainly as would be necessary for minimum enforcement under more normal marketing conditions.

However, new budgetary conditions for the ensuing fiscal year have permitted some increase in the size of the compliance staff.

Director Has Direct Control

The Director of the Division maintains direct control over the Division's compliance work. The compliance staff is organized into two units. One, the Compliance Coordinator's Office, in Washington, and the field staff, under the managers of the district offices, which conducts the investigatory work. The other, the Compliance Proceedings Unit of the Office of the General Counsel, takes the legal steps necessary in compliance cases.

Reports of violations are received through the district offices, and also directly from district boards, code members, and distributors. By an order dated September 27, 1940, the district boards are charged with the duty of aiding the Division in obtaining compliance. Most of the boards have set up compliance committees and employed personnel for this purpose.

Public Hearings Held

Except in cases where violations are admitted, and the defendant signs a stipulation consenting to the entry of an order by the Division

compliance orders are issued only after public hearings in which all parties are given an opportunity to participate.

Thus far all but one of these compliance hearings have been held in the field, as near as possible to the principal places of business of the defendants. This was done in order not to burden unduly small producers and distributors by requiring them to travel long distances to Washington. In the future, however, many of the cases involving larger producers will be noticed for hearing in Washington.

Hearing compliance cases in the field requires sending a staff of Division employees, including a trial examiner and an attorney from the Washington office to the hearing places.

Categories of Violations

The two principal categories of defendants in compliance cases are code members and registered distributors. The activities of the district boards in filing complaints thus far have primarily concerned code members. To date, the Division, on its own motions, has instituted most of the proceedings involving registered distributors. Under the Coal Act, the Division is not authorized to file complaints against code members except where the district boards have failed to act. If a board fails to act, then the Division may supersede it and file complaints directly. In the case of registered distributors, the Division is vested with authority to act upon its own motion, although the district boards and others also may file complaints against such registered distributors.

Information on which the boards act in filing complaints against code members and others is obtained directly by the board in some instances, but in most cases it is submitted to the board by the Director of the Division after an investigation.

Types of Violations

By far the largest percentage of compliance cases has involved the sale of coal at prices below the effective minimum. Although such cases in large part involved violations on direct sales at the mine, in many instances the producer either failed to add the full transportation or other costs to the effective minimum mine prices on sales f. o. b. destinations, or allowed unauthorized discounts to distributors which resulted in sales below the effective minimum prices.

The distributor cases involve violations not only of the rules and regulations governing distributors, and the marketing rules and regulations, but also violations of the unfair trade practice provisions of the act. Some of these violations have occurred while registered distributors were purporting to act in the capacity of sales agents, and in such capacity sold coal for code members at prices below the effective

minimum. In their agreements filed with the Division, as a condition to the granting of their applications for registration, the distributors agree not to violate the effective minimum prices and other rules and regulations.

215 Formal Cases

During the 9 months ending June 30, 1941, since minimum prices have been in effect, 215 formal complaints, and other compliance proceedings necessitating hearings and formal action, have been filed with the Division.

During this period, the Division has conducted 71 compliance hearings. In addition to this, action was taken in 37 cases on the basis of the defendants signing stipulations admitting the violations and agreeing to the entry of compliance orders, thus making formal hearings unnecessary. As the result of these proceedings, the Division issued 33 cease-and-desist orders, restraining code members from committing further violations, and it issued one order revoking the code membership of a producer. In addition, the code memberships of two more producers were revoked on the basis of stipulations signed by them in which they admitted the truth of complaints charging violations and agreed to the entry of final orders by the Division. The Division has issued two orders suspending the registration of distributors. Five compliance cases have been dismissed by the Division, two of which were dismissed after hearings. There are 59 cases in which hearings have been held and action either by the trial examiner or the Director is pending.

7. Litigation

Only three lawsuits seeking review of the orders of the Division establishing minimum prices and marketing rules were instituted in the United States courts. One of these cases—the only one attacking the fundamentals upon which minimum prices were based—was dismissed at the request of the parties who filed it. A second was also dismissed. In the third case, proceedings have been stayed pending the Division's action on petitioner's request for an adjustment of the minimum prices in question.

In all, there were only six suits against the Secretary of the Interior and Director of the Division, involving the administration of the Coal Act, during the past fiscal year.

Only Fundamental Case Dismissed

The lawsuit attacking the fundamentals upon which the minimum prices and marketing rules were based was *Ayrshire Patoka Collieries Corp., et al., vs. Ickes, et al.*, No. 7482 U. S. Circuit Court of Appeals

for the Seventh Circuit. The petition in that case was filed on October 22, 1940, and requested the court to review, with respect to a substantial number of the established minimum prices, the orders establishing prices and marketing rules and regulations. The producers alleged that the orders, findings of fact, and conclusions of law upon which the minimum prices and marketing rules were based were erroneous, contrary to law, and unsupported by substantial evidence. On February 2, 1941, upon the filing of a stipulation agreeing to its entry, the Court entered an order dismissing the case.

The other two cases seeking review of minimum prices were filed by two producers asking review of the particular minimum prices established for their respective mines.

Powhatan Mining Co. Cases

Three petitions were filed in the United States Circuit Court of Appeals for the Sixth Circuit, challenging the effective minimum prices established for three-eighth-inch slack coals produced by the Powhatan Mining Co., an Ohio producer. The Ohio & Pennsylvania Coal Co., another producer in that State, joined in one of the suits, in respect to its three-eighth inch coals.

The petitions in the cases of *The Powhatan Mining Co. vs. Ickes, et al.*, No. 8797 and No. 8798, U. S. Circuit Court of Appeals for the Sixth Circuit, were filed on November 1, 1940. In No. 8797, the petition sought review and reversal or modification of the order of the Secretary dated September 24, 1940, overruling the exceptions of Powhatan to the order of the Director establishing minimum prices for the particular size of the company's coal. In No. 8798, the petitioner asked for reversal of an order of the Director dated October 26, 1940, denying temporary relief in Docket No. A-41, a proceeding instituted by Powhatan for revision of minimum prices established for that size. The petition also prayed for an interlocutory order granting the relief denied by the Director.

On November 2, Powhatan filed motions for stays of the respective orders of which review was sought. On November 12, the court heard oral argument on the motions and took them under advisement with the suggestion that the proceeding initiated before the Division be resumed.

Thereafter, on November 14, the hearing noticed before the Division on Powhatan's petition and on a similar petition filed by the Ohio & Pennsylvania Coal Co. (Docket No. A-40) was convened. That hearing ended on November 19, and on November 23 the Director issued an order denying the relief requested by both petitioners.

Thereupon, on November 26, 1940, a joint petition was filed in the case of *The Powhatan Mining Co. and The Ohio & Pennsylvania Coal*

Co. vs. Ickes, et al., 8826. This petition sought the reversal of the Director's final order denying relief in the administrative proceedings. Petitioners simultaneously moved for a suspension and stay of the Director's order.

On December 4, 1940, the Circuit Court of Appeals entered an order in Nos. 8797, 8798, and 8826, denying petitioners' motion to suspend the various orders from which review was sought and setting down the several suits for final hearing before the court.²

At the hearing before the Director in November, in Dockets Nos. A-40 and A-41, exhibits showing tabulations of data taken from mine invoices were introduced by the Division. Petitioners requested the Director to have the exhibits decoded so as to show the identities of the particular producers who filed the invoices. The Director ruled that this could not be done under the act because the invoices were filed as confidential records of the code members. However, he stated that subpoenas would be issued for the particular producers involved, in instances where the parties requested them, in order to permit cross-examination regarding specific items questioned.

On March 14, 1941, when the court issued its decision in case No. 8826 reversing the Director's order denying the price revision, and remanding the case to the Division for rehearing, it appeared that the court had not passed upon the merits of the controversy, but had held merely that the Division had erred in not decoding the exhibits on the ground that disclosure of the basic invoice data was not prohibited by section 4 II (a) of the Coal Act. The court found that such disclosure was necessary in order to afford the parties a full and fair hearing.

In accordance with the court's decision, the Division then noticed Docket Nos. A-40 and A-41 for a rehearing, but the companies filed a new motion with the Division asking that the proceedings be dismissed. The Director issued an order of dismissal as requested.

On June 25, 1941, pursuant to a motion agreed upon by the parties, the court entered an order dismissing the appeal in case No. 8797.

Wheeling Township Case

The petition in *Wheeling Township Coal Mining Co. vs. Ickes, et al.*, No. 8824—U. S. Circuit Court of Appeals for the Sixth Circuit—was filed on November 23, 1940. It sought review of an order of the Secretary of the Interior, dated September 24, 1940, overruling the company's exceptions to the order of the Director establishing minimum prices and marketing rules. The company asked that the court set aside the orders establishing minimum prices for the company's

² The court also allowed the petitions of various district boards to intervene as respondents in the court proceedings.

coals; that lower minimum prices for certain of the company's coals be established; and that the court hold that the establishment of minimum prices for coals exported to Canada is unconstitutional. On January 11, 1941, the court entered an order staying all proceedings in the case until after the Director had made a final decision on a petition filed with the Division for an adjustment of the minimum prices for the company's coals. Final decision in this matter now is pending before the Division.³

Blue Bird Coal Co. Case

The administration of the act was indirectly involved in proceedings for an arrangement between the Blue Bird Coal Co., debtor, with its creditors, No. 3251-D, District Court of the United States for the Eastern District of Illinois.

On December 6, 1940, the Blue Bird Coal Co. filed a petition praying that the court, which had jurisdiction over its property and assets, instruct it as to whether or not sales of coal under a contract between the Ender Coal & Coke Co., exclusive agents for Blue Bird, and Armour & Co., entered into on June 5, 1933, and extended thereafter from time to time, were exempt from effective minimum prices, pursuant to those provisions of the Bituminous Coal Act of 1937 which exempt sales under contracts made prior to June 16, 1933. Pursuant to an option for the extension of the original contract, a new written agreement had been entered into on March 21, 1935.

The Division, though not made a party to this proceeding, appeared at the hearing. At the time, there was pending before the Division a petition filed by Blue Bird applying for exemption of the sales in question for the reason above mentioned and for the further reason that they were not in interstate commerce.

On June 24, 1941, the court entered an order that sales under this contract were in interstate commerce and were subject to minimum prices established under the Coal Act. The court held that the transactions were not exempted by virtue of the date of the original contract, that sales made since March 21, 1935, were not made under the original contract and hence not under a contract entered into prior to June 16, 1933.

Keystone Mining Co. Case

The petition in *Keystone Mining Co. vs. Gray*, No. 7497—October Term, 1940, United States Circuit Court of Appeals for the Third Circuit, requested the court to review and set aside the Director's order of June 5, 1940, denying an application of the Keystone Mining Co. for exemption from minimum price regulation. The applica-

³ The report of the examiner in this matter was filed with the Director on August 6, 1941.

tion was based upon the averment that coal produced by the petitioner and delivered to and used by its subsidiary, the Delaware, Lackawanna & Western Railroad Co., was coal consumed by the producer and coal transported by the producer to himself for his own consumption and thus exempt under the act. The Director, after hearing, found that the Keystone Mining Co. was not the agent of the railroad company and that coal consumed by the railroad company was not coal consumed by the producer.

On April 22, 1941, the court affirmed the Director's order. The court refused to apply the agency rule for the purpose "of piercing the veil of the corporate entity." It held that the railroad neither owned the mines nor participated in any way in the mining operation, and that the coal company alone, not the railroad company, was the producer of the coal within the meaning of the Coal Act. The court based its decision in large measure upon the legislative history of the act and the effect of the sanction of the parent-subsidy device as a means of circumventing price regulation under the act.

Seaboard Air Line Case

The question of exemption from minimum price regulation also was involved in the case of *Leigh R. Powell, Jr., and Henry W. Anderson, as Receivers of the Seaboard Air Line Railway Co., vs. H. A. Gray, et al.*, No. 4671, U. S. Circuit Court of Appeals, Fourth Circuit.

Petitioners asked the court to review an order issued by the Director denying the railway's application for exemption from minimum price regulation. It was contended that the railway had leased coal land and entered into agreements with three independent contractors to mine coal for petitioners, and that the coal was consumed entirely by petitioners in the operation of the railway. Petitioners claimed exemption under section 4 II (1) of the act exempting coal consumed by the producer thereof.

The Director held that there was no agency relationship between petitioners and the contractors, that the work of coal mining was performed solely by the independent contractors free from control or domination by petitioners, and that petitioners were not the producers of the coal.

On September 26, 1940, the court reversed the Director's order. It held that petitioners were the producer; that they controlled the coal in place through lease from the owners; that they did not acquire title to the coal from the contractors but from the lessors of the coal lands; that petitioners did not pay the contractors for the coal, but for mining it; that the contractors were entitled to mine it only because they were mining for the petitioners; and that the petitioners therefore necessarily controlled the mining operations.

On March 31, 1941, the decision of the circuit court was affirmed by the United States Supreme Court by an equally divided court (a vacancy existed). A motion for reargument before a full bench has been filed and granted, and the case set for reargument on October 13, 1941. Pending disposition on reargument, the Supreme Court has stayed the order of the court below.

8. Research

Section 14 of the Bituminous Coal Act requires study and investigation of certain general matters. The Division is to report annually the results of these investigations to the Secretary of the Interior, for transmission by him to Congress. These matters concern the uses of coal, importation and exportation, economic operation of mines with a view toward conservation, mine safety, distributing costs, and tonnage allocation.

Definite progress has been made by the Division on these general research matters, but only on the preliminary phases of the undertakings contemplated by the act. Substantial sums for technical personnel and equipment will be needed to meet fully the requirements of the act.

In relation to uses of coals, the Division has compiled detailed information on the competitive fuel situation and on coke and strategic byproducts. Mine operation has been analyzed in terms of costs per unit of output. However, the full development of research into the uses of coal and mine operation will necessitate the availability of a large technical staff and laboratory equipment, which will require additional funds.

On distributing costs, the Division has completed a detailed study on selling items which was made available for General Docket No. 23 in connection with the redetermination of costs.

As to mine safety, the approval of the mine inspection bill, May 7, 1941, which is administered by the Secretary of the Interior acting through the United States Bureau of Mines, makes provision which is more inclusive than does the Bituminous Coal Act. Thereupon, in order to avoid duplication of effort the Coal Division is not now carrying on any activity in the safety field except to make available to the Bureau of Mines such information and expert help as the Bureau might request.

Activity with regard to importation and exportation and tonnage allocation has been affected by the war emergency, since these are matters directly involved in the defense program which is administered by other agencies. Within the limitations of its financial means, the Division has been continually active in collecting and analyzing data pertinent to these matters and is cooperating with other agencies whenever occasion arises.

Petroleum Conservation Division

GEORGE W. HOLLAND, Director

WITH PETROLEUM and petroleum products becoming an ever-increasing factor in National Defense, operations of the Petroleum Conservation Division assumed greater importance during 1941, as that agency prepared to enter its sixth year of enforcement responsibilities under the Connally Hot Oil Act of February 22, 1935.

Established by the Secretary of the Interior to assist in the administration of Connally Act provisions calling for the regulation of interstate and foreign commerce of petroleum and its products produced in violation of State laws, success of the Division's work is indicated by the fact that on two occasions the legislative authority contained in the Act has been extended by Congress, and that recommendations that the legislation under which it operates be given a permanent status have been made by the Secretary of the Interior.

Moreover, experience of the Division in administering the law during nearly 6 years has indicated no need for changes in the wording or provisions of the act, while it has withstood a number of legal attacks in the Federal Courts in Texas and Louisiana.

While the Connally Act is applicable to any State having a conservation law regulating the production of petroleum, the tender system has heretofore been used only in the East Texas oil field. However, by order, approved by the President on May 26, 1941, the Secretary of the Interior extended the area, from which monthly reports of operations of producers, refiners, and transporters of petroleum will be required, into portions of New Mexico, Texas, and all of Louisiana. Areas other than those designated in the Secretary's order will be under constant observation by examiners of Federal Tender Board No. 1 and the Petroleum Conservation Division and no crude petroleum or petroleum products are permitted legal shipment from coastal points of Texas and Louisiana without reporting to the Petroleum Conservation Division the field of origin and the State orders under which the oil moves. During the fiscal year, approximately 14,500 shipments, and a like number of discharges were reported to this Division.

Operations in East Texas

Federal Tender Board No. 1 is located at Kilgore, Tex., in the heart of the great East Texas field, and operates in an area of five counties comprising this vast oil field. The Board is required, upon application, to issue certificates of clearance, or tenders, permitting the shipment in interstate commerce of petroleum and petroleum products whenever it determines that the petroleum or petroleum products do not constitute contraband oil as defined in the Connally Act. While not in effect at the present time, "Regulations governing reports and inspections of facilities and agencies for the production, processing, storage, and transportation of petroleum and petroleum products" were, on August 1, 1941, made applicable to the oil producing area of southeast and west Texas, comprising 102 counties, two counties in New Mexico, and the entire State of Louisiana. These regulations will be administered by Federal Tender Board No. 1 under the supervision of the Secretary of the Interior.

During the fiscal year, the Board considered 3,987 applications for clearances or tenders, of which, 2,886 were for 177,605,431 barrels of crude petroleum; 227, for 133,491 barrels of scrubber oil; and, 784, for 18,058,068 barrels of products. However, 26 tenders for 222,697 barrels of crude and 1 tender for 1,000 barrels of scrubber oil were not approved, and reductions of 927,484 barrels were made in tenders of crude petroleum.

The allowable production of crude for the east Texas oil field during the fiscal year was 134,063,089 barrels, of which 132,289,294 barrels were reported to the Board, amounting to more than 98 percent of the entire allowable production.

The aggregate quantity of petroleum approved for shipment in interstate commerce was substantially larger than that actually produced in the east Texas field, owing to the retendering of oil legally produced and held in storage, and oil previously tendered and not shipped, oil produced elsewhere but received in the east Texas area, and oil interchanged between companies operating in the area.

There were 25,714 producing wells in the east Texas field on June 30, 1941, which was 115 less than the same time last year, although 504 new wells were completed during the year and the density of wells per acre remains the same, 5.09 wells per acre. The average underground pressure declined from 1,059.61 pounds in June 1940 to 1,042.29 pounds as of June 1941, a decline of 17.32 pounds, compared with a decline of 25.47 pounds for the preceding year. An average of 7,740,000 barrels of crude oil was produced for each pound of decline in reservoir pressure, as compared with 5,500,000 barrels for the preceding year.

Sixteen natural gasoline plants, which were connected to 24,654

wells, reported operations to Federal Tender Board No. 1 during the fiscal year. These plants produced 7,446,858 barrels of petroleum products.

Examinations Outside the East Texas Area

Offices for the investigation of alleged Connally Act violations were maintained during the year at Houston, Tex., New Orleans, La., and Wichita, Kans. The office at Lansing, Mich., was closed in September 1940, and the personnel transferred to Wichita, Kans.

Special Investigations and Litigation

Since the establishment of Federal Tender Board No. 1, more than \$269,600 in fines and bonds forfeited have been assessed by the courts for violations of the Connally Act. Disposition and status at the close of the fiscal year 1941, of the 9 criminal and 3 civil cases pending in the United States district courts and 11 major cases under investigation carried over from the fiscal year 1940 to the fiscal year 1941, are as follows:

1. Five criminal cases involving 3 corporations and 30 individuals, on the dockets of United States district courts pending court action.
2. Three case reports submitted were closed by the Department of Justice upon recommendations by the United States Attorney's office.
3. Three were dismissed from the court docket by the court upon recommendations of the United States Attorney.
4. One criminal case report submitted was pending action by the Department of Justice.
5. Two investigations were closed by action of the Board because of insufficient evidence to recommend prosecution.
6. Six were brought to a close by successful prosecution or guilty pleas entered and a total of \$38,500 in fines assessed and suspended sentences from 1 to 5 years imposed.

Of the three civil cases pending at the beginning of the fiscal year, 1941, all were decided during the year by the United States Circuit Court of Appeals for the Fifth Circuit in favor of the Board.

During the fiscal year, 1941, in addition to the multitude of routine investigations by examiners of the Board of leases, pipe lines, refineries, reclamation plants, casinghead gasoline plants and other facilities of the oil industry necessary as routine assignments in establishing the character of oil destined for interstate commerce, nine major investigations were begun by the Board.

Disposition and status of these nine investigations at the close of the fiscal year 1941, are as follows:

1. One investigation was closed by return of a "no bill" by a Federal grand jury.

2. Two investigations were closed by action of the Board because sufficient evidence to recommend prosecution by the Department of Justice did not develop.

3. One investigation has been completed and a report thereof submitted to the Department of Justice for action.

4. One case was successfully presented to a grand jury and an indictment, containing 31 counts and naming 4 individuals and 8 corporations as defendants, was returned to the court. The case was pending court action at the close of the fiscal year 1941.

5. Four investigations were still in process at the close of the fiscal year 1941.

Thus the 9 criminal cases, 3 civil cases and 11 investigations pending at the beginning of the fiscal year 1941, and the 9 investigations begun by the Board during the year 1941, have been disposed of as outlined above except 7 cases and 5 investigations, the status of which at the close of the fiscal year 1941, is as follows:

1. Two cases pending action by the Department of Justice.

2. Six cases are pending court action.

3. Four investigations were still pending completion.

Cost of administration.—The administration of the Connally Act is essentially a field activity; of the 86 persons employed on June 30, 16 were in Washington and 70 in the field.

The following table shows the expenditures of available funds for the fiscal year:

Personal services:	Appropriation
Petroleum Conservation Division.....	\$42, 970
Federal Tender Board No. 1.....	167, 353
Total.....	210, 323
Miscellaneous:	
Materials and supplies.....	9, 436
Communications.....	2, 409
Travel.....	9, 865
Transportation of things.....	275
Printing and binding.....	963
Rental of Buildings.....	7, 553
Equipment.....	13, 653
Total.....	44, 154
Total obligated.....	254, 477
Unobligated.....	523
Total funds available.....	255, 000



FRED W. JOHNSON, Commissioner

PROBLEMS of modern national defense involving the remaining unappropriated and unreserved portions of the public domain placed increased responsibilities upon the General Land Office during the past fiscal year, particularly with regard to the need for new supplies of strategic minerals, power and grazing facilities, and the military and naval requirements for large areas for aerial bombing ranges, antiaircraft ranges, combat training fields, and artillery practice grounds. Although first consideration was given to the requirements of national defense, at the same time the policy of practical conservation, or planned use of our natural resources for the permanent welfare of the Nation, is being carefully and steadfastly developed.

Notwithstanding these additional burdens incident to national defense, the General Land Office maintained its position as one of the few agencies of the Federal Government whose operations result in a cash profit to the American taxpayer. Total cash receipts from all sources during the year amounted to \$7,732,341.93. This was more than three times the amount of the expenditures (\$2,116,078) and made the fifth consecutive year in which the receipts were in excess of \$7,000,000. The average receipts for the years 1933 to 1936, inclusive, amounted to \$4,472,358.48. The average expenditures for the same

period were \$1,425,965, resulting in an average surplus of receipts over expenditures of \$3,046,393.48.

During the fiscal year ending June 30, 1941, withdrawals of public land for use in connection with the national defense program aggregated approximately 6,250,000 acres. These withdrawals included 6,209,932 acres for the Army, 4,509 for the Navy, and 6,983 for the Civil Aeronautics Administration.

In many parts of the United States, the only map data available for military purposes are the township plats in the custody of the General Land Office, showing the boundaries of lands and the general topography descriptions compiled in connection with the public land surveys. In addition to furnishing such information for defense agencies, surveys and resurveys were made for the War Department, Navy Department, and the Federal Communications Commission in the interest of direct defense and preparedness, and for other Departments and Bureaus in the interest of conservation and development of natural resources. During the year, the cadastral engineering activities of the General Land Office resulted in surveys and resurveys in the field covering 4,851,336 acres, or approximately 7,580 square miles.

A new edition of the Official Map of the United States, revised to include many new outstanding defense and conservation areas, was brought to completion during the past fiscal year. Preparation of this map has been the responsibility of the General Land Office since it was first issued in 1880 by specific direction of Congress.

Restoration to Federal ownership of approximately 8,000,000 acres of land in 11 Western States through the closing out of early railroad land grants was another important activity of the office during the fiscal year, brought about by amendments of the Transportation Act of 1940 affording opportunity for the institution of higher rates on certain forms of Government passenger and freight traffic following release of all claims to earlier grants. As a result, more than 70 such releases, entailing a full year of investigation by research experts, were submitted to the Secretary of the Interior for his approval, in accordance with the provisions of the Transportation Act.

The release of these lands to Federal ownership signaled the close of a 90-year era which witnessed the development of the United States westward to the Pacific through railroad construction aided by grants of the then-plentiful expanse of public domain. Ushered in by the Congress in 1850, with the allocation of 2,595,000 acres of the public lands for the construction of the Illinois Central Railroad, the development grew rapidly throughout the West until more than 75 grants, aggregating 158,293,000 acres, had been made. Out of this policy of encouraging railroad building by land grants sprang 21,500 miles of trackage which today form part of the transcontinental transportation network of the United States.

Another important angle in General Land Office activities during the year lies in the fact that under the mineral leasing laws (covering coal, oil and gas, oil shale, potash, sodium, phosphate, and sulphur), substantial known deposits of such minerals on the public lands are still held by the Government. It is estimated that 700 billion tons of coal (including lignite) or about 20 percent of the total coal resources of the United States, are in public lands including land to which the Government has parted only with surface title. Almost 5,000,000 acres of the public domain are under oil withdrawal. Between 7 and 8 percent of the Nation's known oil resources are estimated to be on Federal lands. Except for 29 permits covering 60,188 acres in Alaska, all lands held under the oil and gas provisions of the leasing act are now embraced in leases. During the year 13 oil and gas leases, covering 2,004.74 acres in producing structures, were sold at public auction, in accordance with the policy of the Department to lease Government oil and gas lands which are subject to drainage as a result of drilling operations on nearby privately owned lands.

Great quantities of Douglas fir and other valuable timber on 2,500,000 acres of revested and reconveyed Oregon and California grant lands in western Oregon, once threatened with wasteful depletion are now controlled under sound conservation principles whereby a permanent supply of timber is assured. Strict observance of the sustained-yield policy followed in the administration of these lands protects the forests from damaging inroads into the timber resources in striking contrast to the situation during the earlier periods of unrestricted tree-felling which wrought havoc to the timber supply in this region.

Much of the unappropriated, unreserved public domain is not in compact blocks, but is so scattered and intermingled with privately owned lands as not to justify inclusion in grazing districts, as provided for by the Taylor Grazing Act. The act, therefore, provides for leasing these scattered tracts for grazing purposes to individual stockmen with preference to those who own or control the adjoining lands. The leasing of these scattered tracts is administered by the General Land Office, under the program for prudent conservation of natural resources. At the close of the year, grazing leases were outstanding on 9,110,974 acres, compared with 7,411,986 acres outstanding at the close of the preceding year. Revenues from grazing leases during the fiscal year aggregated \$191,024.76, compared with \$152,378.34 during the preceding year.

Regulations governing the utilization, primarily through lease, of small areas of the public domain, outside certain national reservations, for home-site, cabin, camp, health, convalescent, recreational, or business-site purposes, under the provisions of the Five-Acre Tract Act of June 1, 1938 (52 Stat. 609), authorized the filing of applications for

such sites commencing August 9, 1940. Since that date a large number of applications have been received, principally from the States of Arizona, California, Nevada, and Wyoming. All applications received are considered in the light of their effect upon the conservation of natural resources and with respect to the effect they may have, if allowed, upon the welfare, not only of the applicants themselves but also of the communities in which the lands applied for are situated.

The functions of the General Land Office are administered by the Commissioner through a Washington office and integrated field organizations. The Washington office organization of the General Land Office consists of the Branch of Adjudication (including the Homestead, Indian Lands, Reclamation and Land Grant, and Minerals Divisions); the Branch of Planning, Use, and Protection (including the Survey, Range Development, Research and Analysis, and Land Classification Divisions); and the Administrative Division (including the Accounts, Posting and Tract Records, Mail and Files, Patent, and Personnel Divisions). The field organization consists of 25 district land offices; the Cadastral Engineering Service with headquarters office in Denver, Colo., with 13 district offices; the Oregon and California Revested Land Administration headquarters office in Portland, Oreg., with 3 branch offices; the regional offices of the Range Development Service located at Santa Fe, N. Mex., Cheyenne, Wyo., Reno, Nev., and Portland, Oreg.; and the Alaskan Fire Control Service with headquarters at Anchorage, Alaska. On June 30, 1941, the General Land Office had 672 permanent employees which included 336 in Washington, 71 in the district land offices in addition to 22 registers 153 in the Cadastral Engineering Service, and 90 in the other field services.

During the fiscal year, the Branch of Adjudication continued its work of adjudicating all claims to the public lands initiated under the numerous public land laws including mineral, grazing, and other applications, and granting railroad and other rights-of-way over the public lands.

The Branch of Planning, Use, and Protection made substantial progress on an inventory of the resources of the public domain; the development of range improvements; the mapping of the public domain lands; the classification of lands for which application for entry, selection, or location had been made; and the assembly and analysis of information concerning the economic resources of the Western States and Alaska.

The Public Lands

Surveyed and unsurveyed public lands.—The original public domain, exclusive of Alaska, aggregated 1,442,200,320 acres. As of June 30,

1941, 1,321,731,522 acres had been surveyed, leaving 120,468,798 acres unsurveyed.

In Alaska, embracing about 378,165,760 acres, the area surveyed as of June 30, 1941, was 2,276,638 acres, leaving 375,889,122 acres unsurveyed.

Vacant and unreserved public lands; grazing districts.—On June 30, 1941, the area of the vacant and unreserved public lands, exclusive of Alaska (unreserved except for the general orders of withdrawal issued in 1934 and 1935) aggregated 41,247,407 acres outside of grazing districts. The area of vacant public lands within grazing districts and subject to grazing use was 131,151,696 acres. The area which was vacant and unreserved, in Alaska, on the date mentioned is estimated at 323,000,000 acres.

Management and Conservation

For the first century of the history of the General Land Office, its chief function was to transfer the public lands into private ownership. This was in line with the prevailing philosophy of the day, which was that all lands not needed for certain limited public functions would be put to their highest and most desirable use if owned and managed by private interests. This philosophy came naturally to an alert and vigorous people who were faced with a seemingly illimitable expanse of agricultural and mineral land resources.

During the latter years of the nineteenth century, however, it became evident that unless steps were taken to conserve certain of the Nation's resources they would either disappear or become so misused depleted, or monopolized as seriously to interfere with their usefulness. Accordingly, measures were taken to reserve some of the lands containing these resources for continued public use. Among these were park areas, forest lands, power sites, mineral lands, and grazing lands. The present policy with respect to the entire public domain, both within and without the specially reserved areas, is to administer it in such a way as to provide for its maximum public usefulness, and to conserve its resources for future generations. Generally speaking, the policy is to retain the present public lands in public ownership except where a careful classification shows conclusively that specific tracts can be used successfully in private ownership, without prejudice to the public interest.

The new policy requires land management, not merely land disposal, and in more recent years the General Land Office has been charged with important management responsibilities. It administers the Mineral Leasing Act. It grants rights-of-way for such public utilities as power and communication lines and oil and gas pipe lines. It administers the Oregon and California revested and reconveyed

grant lands and the 5-acre tract act. It leases grazing lands to stockmen outside of Federal grazing districts. It also leases the lands of Alaska for grazing, fur farming, etc. It is charged with the responsibility for fire protection for public lands in Alaska. Since over 90 percent of the area of Alaska is public domain land under the jurisdiction of the General Land Office, the present wide interest in the possibilities of developing its resources requires much additional managerial effort, particularly in planning an integrated economic development for increasing the permanent welfare of the resident population of the Territory.

Land classification.—In keeping with the modern trend and legislative policy as indicated by the Taylor Grazing Act and subsequent legislation, land classification work in the General Land Office has as its broad objective aid in promoting conservation and prudent use of the public domain. Within this broad objective, it is required that land classification be utilized to prevent unwise settlement on, or unwise use of, the public lands, to determine recommended uses consistent with their use capabilities, and to indicate policies and programs necessary to effectuate proper land use. To prevent unwise use is the immediate task of classification in the General Land Office.

During the past year the need for classification has been intensified by the increased land activities occasioned by the emergency defense program. Reports were made on 1,318 applications, of which 919 were reports on applications received under the homestead, public sale, timber and stone, and desert land laws. Adverse reports were made on 258 homestead applications, 71 applications for the public sale of lands, and 21 timber and stone applications. *

In connection with the administration of the 5-acre tract act, field investigations have been made of the areas from which the most applications were received, and suitable tracts of land have been classified for occupancy.

Classification surveys and studies of the natural resources of Alaska have been continued. A land classification survey is being made of the Anchorage-Matanuska Area during the 1941 field season. The study will cover the determination of land use types and their characteristics, an examination of land use experience, and other data necessary to proper land classification in the area.

In order to assist in the classification and utilization of the public domain, special maps of the remaining vacant and unappropriated public lands are being prepared. Maps showing lands in Alabama, Arkansas, Florida, Minnesota, and Oklahoma were made during the year. Detailed base maps showing land ownership data were prepared for use in the Anchorage-Matanuska survey in Alaska.

The Range Development Service was created to supervise the construction of range improvements on the public lands subject to lease

under section 15 of the Taylor Grazing Act of June 28, 1934, as amended. Under the fourth plan of Government reorganization which became effective June 30, 1940, the functions of the Soil Conservation Service in the Department of Agriculture with respect to soil and moisture conservation conducted on any lands under the jurisdiction of the Department of the Interior were transferred to the Department of the Interior. That portion of the soil and moisture program relating to the public domain outside of grazing districts was transferred to the General Land Office and has been integrated with the work of the Range Development Service.

The range improvements consisted of spring development, dams, dikes, fences, reservoirs, rodent control, reseeding, and related projects. A total of 193 projects was completed or under way in ten States, benefiting 905,959 acres of public land, 390,988 acres of private land, 159,926 acres of State land, and 14,720 acres of land in other ownership.

Forestry.—Forest management on the Revested Oregon and California Railroad and the Reconveyed Coos Bay Wagon Road grant lands, occupying a belt 60 miles in width and 300 miles in length in 18 counties in western Oregon, is the responsibility of the General Land Office. The act of August 28, 1937, laid the foundation and frame-



FUTURE FOREST FOR AMERICA

More than 1 million seedlings of fir, spruce, and cedar trees which some day will prove the economic mainstay of many communities in the Northwest, are now growing in nurseries maintained by the General Land Office under its conservation program on 2,500,000 acres of revested Oregon and California Railroad grant lands.

work for a sound forest policy covering these valuable forest resources. This measure provides for the conservation of land, water, forest, and forage on a permanent basis; the utilization of these resources for the purpose to which they are best adapted; and the realization of the highest current income consistent with sound administrative management. It seeks, through the application of the principle of sustained-yield management, to provide perpetual forests which will serve as a foundation for continuing industries and permanent communities.

The past year has been one of continuing progress on problems of readjustment of timber cutting toward the sustained yield capacity of these lands. Care has been taken, however, to cooperate fully with lumber producers who are engaged in filling orders for essential materials needed in the defense program. Since great surpluses of old, over-mature timber on the lands under consideration are adequate to supply all legitimate needs for national defense and normal purposes, numerous applications for the sale of young timber have been rejected. Owners of timber on intermingled private lands are being encouraged to pursue this same policy of cutting only in the mature stands while reserving the young vigorous timber for further growth and future need.

The area contains a total merchantable volume of approximately 50,000,000,000 board feet measure of timber, principally Douglas fir. The volume of timber cut during the year was 383 million board feet, which represents an increase of 65 percent over cutting of the preceding year. The present trend of the increasing cutting rate indicates that the cut in the fiscal year 1942 will closely approach the 500 million board foot average which has been specified by law.

A permanent and well-planned transportation system is without question the most important single factor necessary to a successful forestry program. Adequate roads make possible efficient fire control measures and complete utilization of the timber, both standing and damaged. During the year the five Civilian Conservation Corps camps, assigned to the General Land Office for work in the area, constructed 37.7 miles of high standard truck trails, maintained and improved 140 miles of truck trails, and built six vehicle bridges. Improved communications were developed by the construction of new telephone lines and the maintenance and improvement of other lines.

Many acres of Oregon's most valuable forest land have been made nonproductive through destruction by fire. By reforesting these lands, the highest and most profitable use of the land will be realized. In order to further this reforestation, a forest nursery is being maintained by one of the Civilian Conservation Corps camps under the supervision of the General Land Office. Three hundred and forty acres of denuded lands were reforested during the last planting season with nursery-grown seedlings, and approximately 1½ million seedlings

are growing in the nursery at the present time and will be ready for field planting in the near future.

In connection with the foregoing work of protecting and developing the forests, the General Land Office has cooperated with the Civilian Conservation Corps in training the enrollees. Extensive training has been given in tractor operation, auto mechanics, maintenance and repair of heavy equipment, carpentry, metal working, and bridge construction.

The cash income resulting from timber sales on the Oregon and California revested and reconveyed lands, by fiscal years, was \$421,266 for 1939, \$850,222 for 1940, and \$1,102,179 for 1941. The income for the fiscal year 1941 exceeds that of any previous year. The total appropriation for administration and protection during the 3-year period was \$475,000, leaving a net income of \$1,898,667. The ratio of expenditures to gross income has been approximately 20 percent.

Fire protection.—Fire has long been one of the most destructive enemies of the Nation's natural resources. In connection with its management activities, the General Land Office is engaged in combating this menace, particularly in the Wyoming coal fields, the Western Oregon forests, and the Alaskan forests.

The work of suppressing outcrop coal fires in the vicinity of Gillette, Wyo., was continued throughout the year by a Civilian Conservation Corps camp under the supervision of the General Land Office. These immense coal deposits on the public domain constitute a fuel reserve of untold value, as large scale production could be easily accomplished through strip-mining in the event that production in the eastern fields was impeded. Eight coal fire projects were worked upon during the year. All had previously been worked upon and two were definitely completed, making a total of 15 fires extinguished to date. Satisfactory progress was made on five other projects. Work is still to be begun on several other fires.

Fire protection is given the Oregon and California revested and reconveyed grant land forests on a cooperative basis by the "O and C" Administration of the General Land Office, the Forest Service, and the local fire control association. Additional protection is provided by the Civilian Conservation Corps camps under the jurisdiction of the General Land Office in the area. During the year 12.5 miles of fire breaks in strategic locations were built, fire hazards were reduced along 32 miles of roads, and snags were felled on 87 acres. During the year 15 acres of public camping and picnic areas were developed to provide attractive recreational areas for campers and to minimize the dangers of forest fires originating from camp fires.

On July 1, 1939, the Alaskan Fire Control Service, under the jurisdiction of the General Land Office, was established and given adminis-



UNCLE SAM'S BIGGEST COAL BIN

This view of a mine near Gillette shows the depth of some of the coal beds in north-eastern Wyoming, rated by geologists as the largest potential coal producing region in the United States. A single 1,000-acre tract is estimated as capable of producing approximately 200,000,000 tons of subbituminous coal—sufficient to meet all the Nation's fuel needs for 6 months. Note the comparatively thin layer of top soil over the 92-foot bed of coal. An 8-year battle to prevent destruction by fire of these irreplaceable natural resources forms a spectacular feature of the national conservation work of the General Land Office.

tration of the forest fire problem on an estimated 250,000,000 acres of public domain timber and grazing lands in Alaska. With a 1940 appropriation of \$37,500 reduced to \$27,000 in 1941, the Alaskan Fire Control Service has established a small skeleton year-long organization, supplemented during the fire season by a few temporary fire guards. A small amount of equipment has been purchased, and every effort commensurate with the limited appropriation has been expended by the Service in teaching and practicing the doctrine of fire prevention and fire suppression. The Service is forced to confine its efforts to those limited areas of Alaska made accessible by highways or railroads. In the protected area there has been a gratifying decrease in both numbers and extent of fires on the public domain. Comparing the spring portions of the 1940 and 1941 fire seasons, it is noted that the loss of public domain acreage has been reduced approximately eighty percent.

Fire prevention technique and the principles of instant suppression have been brought before the public through talks before various local bodies and through the press and radio.

There still remains the problem of the reduction of the huge annual fire losses to the extensive, rich natural resources of Alaska lying beyond the scope of the Service. Total value of tangible losses to the Territory is estimated at \$3,700,000; the intangible losses, such as destroyed watersheds, decreased recreational and scenic values, and

depleted revenues from all Territorial resources whose recovery depends upon the existence of forests, cannot be evaluated. With a 5 to 6 months' fire season in a country having an annual precipitation of 8 to 15 inches, a near lack of intra-Territorial transportation facilities, high labor wages, and a forest distributed over an area equal in size to all of the States north of Tennessee and North Carolina and east of the Mississippi River and broken by several mountain ranges towering over 10,000 feet and vast swamps impenetrable during the summer season, the Alaskan Fire Control Service is in dire need of additional funds if it is effectively to combat this great menace to the resources of the Territory and the Nation.

Economic and statistical research.—Basic to the proper management of the public domain and to the judicious utilization of its natural resources is a complete and continuous inventory of the lands held by the Federal Government. The early policy of rapid transfer to private ownership required only accurate disposition records, but the change to a policy of management and conservation now makes necessary a complete, flexible system of Federal land records for the use of the General Land Office and the other land management agencies of the Government. During the past year, considerable work was done in preparing such inventories.

The Federal land inventory project, started on January 17, 1940, under the sponsorship of the General Land Office and in cooperation with the Work Projects Administration, was continued throughout the fiscal year 1941. When completed, the project will fill a long-felt need by making available, in a single office, information that cannot now be obtained without checking through the records of approximately 35 agencies having federally owned land under their jurisdiction. The inventory of federally owned land from the tract and plat book records of the General Land Office is about 91 percent complete, and the plotting of this information on two sets of county maps is about 70 percent complete. The inventory of vacant, unappropriated, and unreserved lands in the 12 public land States which have no district land offices was completed.

The inventory of the subsurface rights reserved to the Government under patented lands is nearing completion. When completed, the inventory will show the location and extent of the mineral rights reserved to the Government.

Work was also started upon making a record of the railroad grant lands reverting to the public domain pursuant to the Transportation Act of 1940.

In connection with the problem of making payments in lieu of taxes upon Government lands, a study is being made of the burden borne by the Oregon and California revested and reconveyed lands as compared with that borne by private land holdings in the area.

Cadastral Surveys and Resurveys

The Cadastral Engineering Service of the General Land Office executes cadastral surveys and resurveys of the public lands in the United States and Alaska, supervises mineral surveys for patent purposes, prepares the field notes and plats for such surveys, and acts as custodian of the technical records.

Cadastral engineering activities were carried on in 24 States and the Territory of Alaska, under 172 separate groups, 113 of which in 23 States were resurvey projects. A total of 32,449 miles was surveyed and resurveyed, embracing 4,851,336 acres, in addition to engineering field investigations, miscellaneous surveys, and special projects not measurable on a quantity basis.

In response to requests, surveys and resurveys were made for the War Department, the Navy Department, and the Federal Communications Commission, in the interests of direct defense and preparedness, and for the National Park Service, Bureau of Reclamation, Geological Survey, Office of Indian Affairs, and the Fish and Wildlife Service of the Department of the Interior, and the Forest Service of the Department of Agriculture for conservation and development of land, mineral, timber, and human resources. Surveys and resurveys were also made to meet the requirements of location, description, title, exchange, and lease under the public land laws and policies of the United States.

Survey field notes, 282 township base plats, 125 color overlay sheets, 163 supplemental plats, and 87 special plats of miscellaneous surveys were prepared in final form for the permanent record. In addition, 109 mineral surveys, embracing 589 locations, were examined, platted, and approved.

Accepted surveys and resurveys.—Plats representing 1,481,269 acres of original surveys of public lands were accepted and placed on file. In addition plats of 3,617,007 acres of resurveyed lands were accepted, making an aggregate platted area of 5,098,276 acres placed on file.

Maps, plats, and diagrams.—The 1941 edition of the wall map of the United States has been revised to show changes since the publication of 1938. The map of Nevada is now being revised to show changes since the 1930 edition. One hundred and twenty-one miscellaneous maps, plats, diagrams, and tracings have been prepared.

Filing of plats of survey.—Letters of instruction were issued to District Land Office Registers for the filing of 282 plats of survey of lands under their jurisdiction. Forty-two plats of lands in States in which there are no district land offices were directly filed by this office, and 14 public notices of the actions were prepared.

Leases and Permits

In keeping with a policy of practical conservation, much attention has been given during recent years to regulating the disposition and utilization of natural resources with the objective of better protecting the public interest. It is believed that not only is this objective being attained, but also that private interests are being better served by the operation of a leasing system. The extent of these activities is indicated by the statements which follow.

Mineral leases and permits.—Deposits of coal, oil, gas, oil shale, sodium, phosphate and potash, together with sulphur in Louisiana and New Mexico, belonging to the United States can be acquired only under the mineral leasing laws and are not subject to location and purchase under the mining laws.

On June 30, 1940, there were outstanding 4,368 oil and gas leases issued under the act of February 25, 1920, and the amendatory act of August 21, 1935. During the fiscal year 1941, 1,181 new leases were issued and 1,303 leases were canceled, leaving 4,246 leases outstanding for an aggregate of 4,311,839.72 acres on June 30, 1941. The only permits under the oil and gas leasing laws which have not been exchanged for leases are 29 permits embracing 60,188 acres in Alaska.

At the beginning of the fiscal year, 365 coal leases for 68,050.47 acres were outstanding. During the year, 23 leases were issued and 25 leases, including 2 in part, were canceled, leaving 365 coal leases outstanding for an area of 67,448.18 acres. On June 30, 1940, 136 coal permits covering 105,106.08 acres were in effect. During the year, 23 new permits were issued, 5 coal permits, including 2 in part, were canceled, and 27 permits expired, leaving outstanding 129 coal permits for 90,287.48 acres. Ninety-four coal licenses covering 3,631.53 acres were outstanding at the beginning of the fiscal year. Twenty new coal licenses were issued, 1 license was canceled, and 11 licenses expired, leaving 102 coal licenses for 3,749.63 acres in effect at the close of the year.

Twenty-one potash leases covering 47,092.10 acres were outstanding on June 30, 1940. The status of these leases remains unchanged except for the consolidation of two leases.

Of the seven phosphate leases covering an area of 3,292.90 acres outstanding on June 30, 1940, one lease, covering 914.86 acres, was canceled, leaving six leases embracing 2,378.04 acres outstanding on June 30, 1941.

The three sodium leases covering 1,191.88 acres, which were outstanding on June 30, 1940, remained intact. Sodium permits outstanding increased from 80, covering 144,567.36 acres, to 89, covering 141,117.62 acres. During the year 29 new permits were issued, 1 permit was canceled in part, and 20 permits expired.

There has been no change in the status of the 29 sulphur permits covering 18,517.29 acres which were in effect on June 30, 1940.

Grazing leases.—To prevent overgrazing and soil deterioration and to provide for the orderly use, improvement, and development of the unappropriated and unreserved grazing lands outside of grazing districts in the continental United States and on all unreserved and unappropriated grazing lands in Alaska, leases are issued by the General Land Office.

During the year, 2,015 new grazing leases, involving approximately 1,835,137 acres, were issued under section 15 of the Taylor Grazing Act, at an annual rental of \$34,660.94. Renewals of leases were granted in 540 cases involving 655,321.69 acres with annual rentals totaling \$11,971.01. There were outstanding on June 30, 1941, 7,446 grazing leases covering an area of 9,110,974.52 acres. During the year 54 leases were canceled, 75 leases expired and were not renewed, 315 assignments of grazing leases were approved, and 737 applications for leases were finally rejected and closed. Nine hundred and fifty-four applications for lease and petitions for renewal were pending on June 30, 1941. The majority of these pending cases awaits reports from the field service.

Eleven grazing leases in Alaska, covering approximately 1,256,424.93 acres, from which the sum of \$1,095.65 was received, were outstanding on June 30, 1941. One lease was granted, one lease was canceled, and four applications for lease were rejected and closed.

Aviation leases.—Twenty-six leases for landing fields and beacon sites, covering approximately 12,815.88 acres were outstanding on June 30, 1941, and the sum of \$251 was received from such leases. Six leases were issued, two leases were canceled, one lease was renewed, and nine applications for lease were rejected and closed.

Fur farm leases.—On June 30, 1941, there were 26 fur farm leases, covering approximately 142,640 acres, outstanding in Alaska from which an annual rental of \$1,070 was received. During the year one lease was issued, one lease was canceled, one lease expired, and one application for lease was rejected and closed.

Other leases.—On June 30, 1941, the following other leases were outstanding: One medicinal spring lease for 40 acres in California, one recreational lease for 20 acres in Montana under a special act, one lease for 80 acres in Wyoming for a Boy Scout camp, one bathing beach lease for 33.01 acres of land in California, and 16 recreational site leases for a total of 19,639 acres.

Special land use permits.—The War Department was granted permission to use two large areas in New Mexico for antiaircraft practice and training and maneuver purposes. The Forest Service was granted one permit to establish a guard station, and another to build a single

track protection road in Oregon. Three applications for special land use permits were rejected.

Timber permits.—During the year 1,519 permits were granted for the free use of timber on the public domain in the Western States and Alaska. The value of the timber has been estimated to be \$27,411.08.

Five-acre tracts.—Actions were taken in 855 instances on applications for 5-acre tracts for home, business, camp, and health sites. Leases granted during the year and outstanding at the close of the year totaled 117, in connection with which \$585 in fees and \$585 in annual rentals were received.

Homesteads, Sales, and Other Entries

Since its organization in 1812, the General Land Office has acted as the real estate agent of the Government. Its early functions were almost entirely to facilitate the transfer of public land to private use and ownership for the purpose of raising revenue for governmental purposes and of accelerating the settlement and development of the West. Progressively over the period other functions have become more and more important, but there still remains considerable public domain land which, if carefully selected and properly used, may best serve the interests of the Nation by being transferred to private ownership. During the fiscal year ending June 30, 1941, transfers of lands were made under laws providing for homesteading and mining claims, and for sale of isolated tracts, timber, stone, townsites, and Alaskan home and business sites. The extent of these transactions is given in the statements which follow.

Homestead entries.—All unappropriated surveyed public lands in the continental United States which are more valuable for the production of agricultural crops than for the production of native grasses and forage plants are subject to classification and opening to homestead entry if they are not mineral or saline in character, are not occupied for the purposes of trade or business, and have not been embraced within the limits of any restrictive withdrawal, reservation, or incorporated town or city. Opportunity for homesteading on the public domain today, however, is limited owing to the character of the land remaining after more than a century of activities which resulted in early disposal of the most desirable tracts.

During the fiscal year actions were taken in homestead cases (excluding homestead entries of ceded Indian lands, abandoned military reservations, and reclamation lands) as follows: Final and commuted homesteads, 1,919; applications to make homestead entry, 2,015; applications to amend, 61; reduction of area of cultivation, 1; applications for leave of absence, 40; applications for extension of time to establish residence, 37; applications for extension of time to make final

proof, 43; original homestead entries, 2,572, of which 1,316 were canceled; applications for change of residence requirement, 5; election intermarriage of homesteaders, 1; final proof, 1,213; applications for permission to make final proof outside of land districts, 10; notices of intention to make final proof, 114; appeals from Registers' and office decisions, 243; and special agents' reports, 1,119. These actions resulted in the issuance of patents for 1,120 homesteads, involving an area of 440,429 acres.

Mineral applications and entries.—Deposits of minerals other than the so-called fuel and food minerals (coal, oil, gas, oil shale, sodium, phosphate, and potash, together with sulphur in Louisiana and New Mexico) in both surveyed and unsurveyed lands belonging to the United States are open to exploration and purchase under the mining laws of May 10, 1872.

On June 30, 1940, there were 74 mineral applications awaiting action. During the fiscal year, 25 mineral applications were received and 27 applications were disposed of, leaving 72 applications embracing 4,120.68 acres pending at the end of the year. During the year 129 mineral entries were received, 118 patents embracing 7,205 acres were issued, and 4 entries covering 30.60 acres were canceled, leaving 102 entries involving 6,214.94 acres pending on June 30, 1941.

Sales.—Various laws govern the sale of specific classes of public lands and resources. During the fiscal year the following sales were consummated:

A total of 2,464 public sale applications was considered, and 135 patents were issued for an area of 14,799 acres.

One patent was issued for 39 acres of land valuable for timber and stone. The total number of cases receiving action during the fiscal year was 118.

The sum of \$1,160.58 was realized from 6 sales of dead, down, and damaged timber. This type of case was considered in 64 instances during the year.

The sale of 5-acre tracts in Alaska for homesites or headquarters was considered in 72 instances. Eight patents were issued covering 28.59 acres.

Twenty-one applications for purchase of sites for trade, manufacturing, and other productive purposes in Alaska were considered.

The sale of town lots in 26 General Land Office town sites resulted in the issuance of 183 patents and the receipt of \$190,203. Some of these lots were sold in prior fiscal years and part payments were made during such years. Regulations were issued to govern the sale of town lots in five town sites. One town-site patent was issued for 67.40 acres.

Color of title.—Color of title laws make it possible for one to purchase Federal land which he has held in good faith and in peaceful

adverse possession for more than 20 years. General color of title cases were considered in 131 instances, and 18 applications were rejected and closed, while 16 patents were issued for a total of 478.29 acres. The sum of \$1,823.17 was received. One patent was issued for 1,796.98 acres of land in Utah under a special act. Action on 17 cases, under the New Mexico color of title act, awaits completion of a survey of the areas involved.

Indian lands and claims.—Special laws cover the disposition of lands ceded by the Indian tribes to the United States. Ceded Indian land entries and purchases were considered in 1,051 instances. Eleven entries were canceled, 252 entries were patented for a total of 36,827 acres, and 13 purchases were patented for a total of 1,434.94 acres. Notices were sent to 206 entrymen and purchasers concerning the benefits offered under the act of July 11, 1940, and two entries were reinstated.

In the matter of Indian allotments 20 trust patents, 186 reissue trust patents, and 9 fee patents were issued. Fourteen patents were issued on Indian homesteads.

Private land claims.—The present title to lands claimed through grants or concessions made by foreign governments before the United States acquired the territory was considered in 119 instances and 30 patents were issued for a total of 46,871.45 acres.

Supplemental patents.—The act of April 14, 1914 (38 Stat. 335), authorizes the issuance of new or supplemental patents, without coal reservations, if, after the issuance of the original patents with such reservations, the lands are classified as noncoal in character. Such new or supplemental patents, without coal reservations, were issued in 134 cases.

Miscellaneous patents.—Other patents were issued covering entries, selections, and claims as follows: Homesteads in abandoned military reservations, 5; military bounty land warrants, 1; cash entries, 35; credit entries, 6; cemetery sites, 1; donation claims, 1; forest lieu selections, 3; riparian rights, 2; scrip of various kinds, 4; small holding claims, 2; soldiers' additional homestead entries, 11; and special acts, 2. Eleven quitclaim deeds were also issued.

Land Grants

In order to assist in the development of new lands, particularly during the early part of the western migration, the Federal Government made grants of public lands to the States, railroads, and others.

State grants and selections.—Extensive grants of lands have been made to the various States to stimulate their growth and development. Among the purposes furthered by these aids have been the support of schools and colleges and the construction of transportation

facilities. The grants included the right of indemnity for lands lost within the original grants.

The area of the indemnity school selections on hand and received for consideration amounted to 233,920.17 acres. Selections embracing 180,373.93 acres were approved, and title to the lands was conveyed to the States. Canceled selections included 864.52 acres. Selections aggregating 52,681.72 acres were pending at the close of the year.

Selections under quantity grants to States for specific purposes, embracing 2,106.13 acres, were approved and title conveyed to the States. The selections pending at the close of the year embraced 193,791.53 acres.

Applications for patents for granted school sections under the provisions of the act of June 21, 1934 (48 Stat. 1185), were approved for patenting during the latter part of the year to the extent of 594,686.85 acres, but the patents had not been issued at the close of the year.

Railroad grants and selections.—The Transportation Act of September 1940 has closed what has been one of the most important phases of public land activity, the granting of large areas of lands to aid in the construction of railroads.

During the year, railroad and wagon road listings and selections were received for only 278.87 acres. No land was certified or patented as indemnity selection.

Rights-of-way.—To facilitate the construction of transportation and communication facilities, the Federal Government has long followed the policy of granting rights-of-way across the public domain. These rights permit uninterrupted flow of traffic despite change of ownership of contiguous lands. Patents issued by the General Land Office in some cases specifically reserve the rights-of-way granted.

Three hundred and ninety-five new applications for rights-of-way for railroads, reservoirs, telephone and telegraph lines, public roads, pipe lines, etc., were received. Four hundred and seventy applications were approved or otherwise disposed of, leaving 197 pending at the end of the fiscal year. Twenty-three maps of approved rights-of-way in Indian and forest reservations were received and the approvals promulgated. At the beginning of the year, 606 cases awaited action. During the year 87 cases requiring proof of construction were received, and 115 cases were acted upon, leaving 578 pending.

Exchanges

The consummation of exchanges of land is authorized by existing laws in promoting matters of public interest such as the grouping of Federal and State-owned land; the elimination of private holdings within national parks, monuments, and Indian reservations; the con-

solidation of national forests, and the establishment of grazing districts and wildlife and bird refuges.

Exchanges with private owners of land resulted in the addition to grazing districts of 23,290.25 acres in exchange for 6,096.37 acres of Government land; to a bird refuge of 4,541.08 acres in exchange for 2,854.25 acres of Government land; to a national monument of 6,421.34 acres in exchange for 11,525.96 acres of Government land; to Indian reservations of 150,805.22 acres in exchange for 150,885.30 acres of Government land; and to national forests of 210,054.84 acres in exchange for 11,667.58 acres of Government land and in addition sufficient timber to equalize the values, as timber is permitted in an exchange of this character and forms about 80 percent of the consideration given by the Government in such exchanges. These exchanges involved the examination of abstracts of title and other evidence in the acceptance of title on behalf of the United States to a total of 395,112.73 acres and the issuance of patents to a total of 183,029.46 acres.

New applications, covering 202,967.13 acres, were made by the various States for exchanges of lands under the Taylor Grazing Act. Eighty-five patents were issued, containing 273,440.93 acres, with a reservation of all minerals to the United States. One patent which contained no mineral reservation was issued for 47.95 acres. The rejected and relinquished applications involved 93,913.40 acres. Other State exchanges approved or patented involved 6,737.51 acres.

Reclamation and Irrigation Activities

Large areas of land in the United States, although inherently valuable, have been unavailable for human use owing to aridness or to overflow conditions. In order to provide an incentive to irrigate and reclaim these lands, the Congress has passed many special laws.

Federal reclamation projects.—The General Land Office is responsible for the survey and disposition of the lands in 51 Federal reclamation projects in 14 Western States. Forty-five of the projects are operated in whole or in part by the water users. In addition, there are five Indian reclamation projects, the irrigation features of which are under the supervision of the Office of Indian Affairs.

Two thousand five hundred and sixty-seven reclamation cases of various kinds were received and 2,635 were acted upon. Two hundred and two reclamation entries, excluding entries made on ceded Indian lands, containing 18,939.11 acres, were patented. These include two entries initiated under the desert-land laws.

Desert-land entries.—The desert-land laws provide for entries by individuals who are required to irrigate and cultivate the lands.

Thirty-eight entries, involving 5,241.88 acres, were patented under such laws.

Carey Act.—The act of August 18, 1894 (28 Stat. 422), known as the Carey Act, was designed to encourage large-scale reclamation of arid lands in certain States. The lands must be reclaimed by the States and disposed of by them to actual settlers.

The area now remaining segregated and unpatented is 94,803.24 acres. An application for reseggregation, involving 3,883.25 acres, is pending.

Pittman Acts.—Patenting of public lands in Nevada on the discovery and development of underground waters is authorized by the Pittman Acts of October 22, 1919 (41 Stat. 293), and September 22, 1922 (42 Stat. 1012). Three cases were pending at the beginning of the fiscal year, two cases were disposed of during the year, and one case is awaiting action.

Swamp and overflow lands.—Under the swamp-land acts, which were passed to aid the States in financing the construction of permanent levees to reclaim swamp lands, 8,772.52 acres were approved and patented to the States. Claims for 34,706.49 acres were finally rejected. New claims were asserted for 10,918.28 acres.

Reservations, Withdrawals, and Restorations

The General Land Office cooperates in arranging for reservations and withdrawals of public lands for various public purposes. The public lands are utilized according to the character of the lands and the public needs and interests. The statement which follows covers the actions taken during the fiscal year relating to the segregation of the public domain for various purposes.

In connection with the national-defense program, 6,209,932 acres were withdrawn for the use of the Army and 4,509 acres for the use of the Navy in the United States and Alaska. The Wupatki National Monument in Arizona was reduced by the withdrawal of a tract of 52 acres as a site for a diversion dam in connection with an Indian irrigation project, and a temporary withdrawal for monument classification was reduced by 3,756 acres. Seventeen new national wildlife refuges were established, and ten refuges were enlarged in the public land States and Alaska. Two wildlife management areas and two Federal-aid wildlife refuges were established in the States, and two refuges in the States and one in Alaska were reduced. The net increase in wildlife reservations is 374,110 acres. Two tracts of 40 acres each of public land in Arizona were withdrawn for use by the Fish and Wildlife Service as administrative sites in connection with cooperative game ranges.

The area of the national forests was increased by 196,865 acres. Withdrawals aggregating 6,983 acres were made for use as air navigation sites upon the recommendation of the Civil Aeronautics Administration. This figure includes withdrawals for use as emergency landing fields in Alaska made upon the recommendation of the Alaska Road Commission. Permission was also granted the Civil Aeronautics Administration to use approximately 200 acres otherwise reserved as a landing field or a beacon site. Tracts aggregating 231 acres were released from former withdrawals for such uses. One patent for 1,098 acres was issued under the recreation law to the State of Oregon at a purchase price of \$1,647; three applications to purchase or lease were denied, and two withdrawals under the act were revoked. Four new stock driveways were created and eight were enlarged; six stock driveways within grazing districts and sixteen outside of such districts were reduced resulting in a net decrease of 60,637 acres.

The area of existing power-site reserves was decreased by 127 acres, the power-site designations by 405 acres, and the lands classified as valuable for hydroelectrical power purposes by 15,274 acres. The public water reserves were increased by 5,995 acres, and the areas in reclamation projects under the act of June 17, 1902 (32 Stat. 388; 43 U. S. C. 372 et seq.), were increased by 47,650 acres.

Two tracts aggregating 10,340 acres excluded from a national forest were withdrawn as town sites for The Alaska Railroad, and a tract of 1,627 acres within a national forest in Alaska was withdrawn by an act of Congress for the protection of the water supply of the town of Petersburg. Two small tracts in California were reserved for use by the State under the jurisdiction of this Department as administrative sites in cooperative forest-protection work. A land utilization project of the Department of Agriculture in Arkansas was abolished by inclusion in a national forest and a similar project in Nebraska was increased, resulting in a net decrease of 2,584 acres in the areas of such projects. A departmental order of withdrawal of 320 acres of public land in Arizona for archaeological investigation was revoked. General withdrawals for classification were increased by 9,799 acres through the elimination of the lands involved from other forms of withdrawal.

Three thousand nine hundred and ninety acres in national forests which had been listed for homestead entry under the act of June 11, 1906 (34 Stat. 233), were returned to national forests by revocation of the listing orders, and 28 acres were restored to homestead entry under the act.

Reports were prepared in connection with several areas available for inclusion within Indian reservations and the restoration of such areas to tribal ownership.

Status and Other Records

The General Land Office maintains records covering all public land transactions. Included are all records of the original surveys and resurveys, copies of patents, the tract books, and other papers relating to the disposition of the lands and resources.

Tract book notations.—The General Land Office maintains approximately 4,000 tract books in which notations are made of all transactions affecting the public lands. These volumes are designed to show at all times the status of all legal subdivisions of the public lands. More than 100,000 notations were made on these records during the fiscal year.

Status sheets.—For use in the adjudication of applications, entries, and other cases, 18,644 status sheets, giving the status of particular parcels of land with respect to conflicts, rights-of-way, withdrawals, et cetera, were prepared.

Township diagrams.—There were prepared 1,128 township diagrams showing lands disposed of by the Government and the status of the remaining lands.

Receipts, Expenditures, and Repayments

The total cash receipts from leases, sales, and other disposals of public lands (including receipts from copies of records, sales of Government property, etc.), were \$7,694,080.94. Receipts from Indian lands were \$38,260.99, making a grand total of \$7,732,341.93, all of which was deposited in the Treasury. The total expenditures from appropriations made for the conduct of the bureau were \$2,116,078. The excess of receipts over expenditures was \$5,616,263.93.

Receipts under mineral leasing acts.—Receipts from bonuses, royalties, and rentals under laws providing for the leasing rights on the public domain (including royalties and rentals on potash deposits and royalties on coal leases in Alaska) aggregated \$6,042,497.39, of which \$5,695,532.23 was received under the act of February 25, 1920 (41 Stat. 437). The largest receipts from any State under this act were from lands in Wyoming, the amount being \$2,081,507.37. California was second with \$2,033,842.32. Receipts from other States were: New Mexico, \$1,029,013.71; Utah, \$188,108.24; Colorado, \$136,570.13; Montana, \$104,680.54; North Dakota, \$50,471.17; Louisiana, \$41,075.05; South Dakota, \$8,649.05; Alabama, \$6,031.90; Kansas, \$5,351.99; Oklahoma, \$3,658.29; Arizona, \$2,905.02; Washington, \$2,699.74; Idaho, \$869.71; Nebraska, \$70; and Mississippi, \$28.

Receipts under the Taylor Grazing Act.—Fees and rentals from leases issued for the use of public lands under section 15 of the Taylor

Grazing Act amounted to \$191,024.76. The largest receipts from any State were from lands in Wyoming, where \$86,953.89 was collected. Receipts from other States were as follows: Arizona, \$24,733.68; Montana, \$20,644.70; Colorado, \$13,372.70; California, \$12,331.53; New Mexico, \$11,162.47; Idaho, \$8,620.01; Oregon, \$5,241.27; South Dakota, \$3,924.84; Washington, \$3,694.68; North Dakota, \$216.51; Nebraska, \$66.57; Oklahoma, \$43.88; and Arkansas, \$18.03.

Distribution of receipts.—Receipts from all sources, aggregating \$7,732,341.93, as shown above, are distributed under the law approximately as follows: To the reclamation fund, \$3,331,678.63; to public land States and certain counties within such States, \$3,046,488.12; to various Indian tribes, \$34,731.27; and to the general fund of the Treasury, \$1,319,443.91.

Under the provisions of the Taylor Grazing Act, 50 percent of the receipts from leases on public lands are paid to the State within which the lands producing such moneys are situated and 50 percent are credited to the general fund in the Treasury. Twenty-five percent of the total receipts are available, when appropriated by Congress, for range improvements.

Five percent of the net proceeds from cash sales of public lands are paid to the public-land States within which such sales were made, and the balance of such receipts from States named in the Reclamation Act is credited to the reclamation fund. The reclamation fund and the States involved receive 90 percent (52½ percent and 37½ percent, respectively) of the receipts under the mineral leasing act of February 25, 1920, and of receipts from potash deposits leased under the act of February 7, 1927. Receipts from sales of reclamation townsites and camp sites and from royalties and rentals from potash deposits leased under the act of October 2, 1917, are credited to the reclamation fund. Seventy-five percent of the receipts from the Oregon and California Railroad grant lands are paid to the counties within which the lands are situated and 25 percent are credited to the general fund of the Treasury. Not to exceed 75 percent of the proceeds of land and timber in the reconveyed Coos Bay Wagon Road grant are paid in lieu of taxes to the counties within which the lands are situated. The balance of such proceeds is credited to the general fund in the Treasury. The receipts from Indian lands (except 37½ percent of royalties from Red River oil lands which are paid to the State of Oklahoma in lieu of taxes) are deposited in the Treasury to the credit of the various Indian tribes. All other moneys are deposited in the Treasury to the credit of the general fund.

The following table shows in detail the distribution of the receipts so far as is possible before final settlement of all accounts in the General Accounting Office.

Nature of receipts	General fund	Reclamation fund	States and counties	Trust funds	Total
Sale of public lands.....	\$76,269.86	\$102,036.58	\$7,429.44	-----	\$185,735.88
Fees and commissions.....	11,964.53	41,306.90	-----	-----	53,271.43
Rentals and royalties from mineral lands (oil and coal).....	577,015.82	2,990,154.42	2,135,824.59	-----	¹ 5,702,994.83
Sale of land and timber, Oregon and California R. R. grant lands.....	223,058.99	-----	669,176.98	-----	892,235.97
Sale of land and timber, Coos Bay Wagon Road grant lands.....	239,556.43	-----	² 26,000.00	-----	265,556.43
Rentals for grazing lands, section 15, Taylor Grazing Act.....	95,512.38	-----	95,512.38	-----	191,024.76
Potash royalties and rentals.....	29,070.67	193,253.36	109,015.01	-----	³ 331,339.04
Rentals for rights-of-way.....	24,852.55	-----	-----	-----	24,852.55
Sale of reclamation town lots.....	-----	4,927.37	-----	-----	4,927.37
Sale and lease of Indian lands.....	-----	-----	3,529.72	\$34,731.27	⁴ 38,260.99
Copying fees.....	18,183.83	-----	-----	-----	18,183.83
Miscellaneous (including sale of standing timber, coal leases and town lots in Alaska, rent of land, etc.).....	23,958.85	-----	-----	-----	23,958.85
Total.....	1,319,443.91	3,331,678.63	3,046,488.12	34,731.27	7,732,341.93

¹ First and last columns include \$7,462.60 royalties collected in Wyoming under the act of June 26, 1926.

² Estimated.

³ Second and last columns include \$40,632.60 royalties collected in California under the act of Oct. 2, 1917. All other potash receipts are from royalties and rentals under the act of Feb. 7, 1927.

⁴ Includes \$9,412.72 royalties and rentals from oil and gas leases for Kiowa, Comanche and Apache Indian lands in the south half of Red River, Okla., of which the State receives 37½ percent of the royalties in lieu of taxes.

Repayments.—The act of June 16, 1880 (21 Stat. 278), and the act of March 26, 1908 (35 Stat. 48), as amended by the act of December 11, 1919 (41 Stat. 366), make provision for the return of moneys received in connection with the disposal of public lands and covered into the United States Treasury.

Repayment may be made to the land applicant or to his heirs or assigns, where lands have been erroneously sold, where payments have been made in excess of lawful requirement, and where applications, entries, and proofs have been rejected, no fraud appearing. Under said laws there were stated 112 accounts, allowing repayment of \$9,892.88, and 10 claims were denied. The claims allowed include one account granting repayment of \$20.49 received in connection with a homestead entry of ceded Indian lands and repaid from Indian trust funds.

Miscellaneous

Equitable adjudication.—Cases involving 597 homestead entries of public lands, 8 homestead entries of revested and reconveyed lands in Oregon, 20 homestead entries of ceded Indian lands, 29 reclamation homesteads, and 11 desert land entries were decided on principles of equity and confirmed.

Civil suits.—Civil suits were recommended in 32 cases to cancel leases and patents, to recover royalties, and to quiet title in the United States. Payments in the amount of \$47,347.52 were collected.

Trespass.—Cases of trespass on the public lands included the

following: Timber, 392; coal, 74; grazing, 3; turpentine, 1; unlawful enclosure, 18; pipeline, 1; gravel, 1; and incendiary fire, 1. The following sums were accepted in settlement: Timber, \$25,289.51; coal, \$1,880.99; grazing, \$18; turpentine, \$189; and gravel, \$100.

Contests.—During the year, 390 contests other than mineral contests, both Government and private, were considered. Approximately 139 hearings were held in the proceedings. At the close of the year 43 contest cases were pending.

Consideration was given 117 mineral contests during the year. Seventy-four were disposed of, leaving 43 pending.

The General Land Office was also called upon to clear the title to several thousand acres of land urgently needed by the Army for defense maneuvers. Title to this land was clouded by mining locations. Adverse proceedings were brought in connection with 7,466 mining claims, of which 1,462 have been declared null and void after contest, and 6,004 are now being contested or are pending immediate action. It is anticipated that, as a result of these proceedings, the War Department will very soon be able to use all the areas needed for bombing and antiaircraft practice purposes without fear of conflict with private rights or interests.

Code of Federal Regulations.—Copy was prepared for Supplement No. 2 to Title 43 of the Code of Federal Regulations. It includes all regulations contained in the 1939 Supplement to Title 43 of the Code, and shows, in addition, all changes which have been made in Chapter 1 of Title 43 of the Code to and including May 1, 1941.

Mineral leases, permits and licenses outstanding June 30, 1941, by classes

Class	Leases		Permits		Licenses	
	Number	Acres	Number	Acres	Number	Acres
Oil and gas.....	1,389	640,003	29	60,188	-----	-----
Oil and Gas Act, Aug. 21, 1935.....	2,857	3,671,836	-----	-----	-----	-----
Coal.....	365	67,448	129	90,287	102	3,749
Potash.....	20	47,092	-----	-----	-----	-----
Phosphate.....	6	2,378	-----	-----	-----	-----
Sodium.....	3	1,191	89	141,117	-----	-----
Sulphur.....	-----	-----	29	18,517	-----	-----
Total.....	4,640	4,429,948	276	310,109	102	3,749

SUMMARY

Class	Number	Acres
Leases.....	4,640	4,429,948
Permits.....	276	310,109
Licenses.....	102	3,749
Total.....	5,018	4,743,806

Leases other than mineral, outstanding on June 30, 1941

Class	Number	Acres	Class	Number	Acres
Term grazing leases under Taylor Grazing Act	7, 446	9, 110, 974. 52	Act of June 30, 1932	1	20. 00
Grazing leases, Alaska	11	1, 256, 424. 93	Boy Scout Lease Act of Jan. 21, 1927	1	80. 00
Fur farm leases, Alaska	26	142, 640. 00	Bathing Beach Lease Act of Apr. 5, 1926	1	33. 01
Aviation leases	26	12, 815. 88	Water well section 40. Mineral Leasing Act	4	160. 00
Mineral or medicinal spring leases	1	40. 00			
Recreational leases: Act of June 14, 1926	16	19, 639. 00	Total	7, 533	10, 542, 827. 34

Original entries and selections made during the fiscal year ended June 30, 1941¹

	Public land		Indian land	
	Number	Acres	Number	Acres
Homesteads:				
Stockraising	17	7, 772		
Enlarged	21	3, 692		
Reclamation	106	14, 199	18	2, 104
Forest	4	602		
Section 2289, R. S., et al.	252	24, 267	7	804
Total original homesteads	400	50, 532	25	2, 908
Deserts	17	1, 721		
State selections	7	1, 462		
Railroad selections	5	16, 987		
Timber and stone, mineral applications and adverse claims	145			
Miscellaneous	22	2, 003	1	
Total original entries and selections	596	72, 705	26	2, 908
Indian land, as above	26	2, 908		
Total	622	75, 613		

¹ An original entry or selection of public land is one made in pursuance of an act of Congress which prescribed the terms and conditions under which patent may be issued or other evidence of title granted.

Final entries, or entries based on final certificates, issued during the fiscal year ended June 30, 1941¹

	Public land		Indian land	
	Number	Acres	Number	Acres
Homesteads:				
Stockraising	655	330, 431	59	16, 369
Enlarged	53	12, 789	130	18, 812
Reclamation	186	16, 886	40	4, 618
Forest	10	912		
Commuted	5	483	25	1, 747
Section 2289 R. S., et al.	283	28, 952	27	2, 156
Total final homesteads	1, 192	390, 453	281	43, 702
Deserts	49	6, 867		
Public auction	253	29, 848	3	137
Timber and stone	2	279		
Mineral	147	10, 958		
Miscellaneous	243	7, 900	37	1, 254
Total final entries all classes	1, 886	446, 305	321	45, 093
Indian land, as above	321	45, 093		
Total	2, 207	491, 398		

¹ A final entry of public land is one upon which final certificate has issued showing that the law has been complied with and that in the absence of irregularity the entryman or claimant is entitled to a patent. If the requirements of law have been met, the equitable title to the land passes to the claimant upon the issuance of the final certificate.

Patents issued and certifications having the effect of patents made during the fiscal year ended June 30, 1941 ¹

	Number	Acres		Number	Acres
Homesteads:			Timber and stone.....	1	39
Stockraising.....	816	405,353	Mineral.....	118	7,205
Enlarged.....	215	38,907	Special acts.....	147	299,138
Reclamation.....	201	18,779	Miscellaneous.....	772	31,365
Forest.....	16	1,355	Total patents all classes.....	2,804	856,840
Section 2289 R. S., et al.....	343	34,418	Certified to States.....		182,480
Total homestead patents.....	1,591	498,812	Total patents and certifications.....	2,804	1,039,320
Deserts.....	40	5,482			
Public auction.....	135	14,799			

¹ Where upon final examination it is found that an entry or selection is in proper form and that the law has been complied with, a patent conveying the legal title to the claimant is issued. In the case of indemnity state selections, the legal title is conveyed upon approval thereof by the Secretary of the Interior and certification by the Commissioner of the General Land Office.

Lands Patented With Mineral Reservations

	Patented during the fiscal year	Total patented to the end of the fiscal year
	<i>Acres</i>	<i>Acres</i>
Stockraising act, all minerals reserved.....	405,353	33,239,469
Other acts:		
All minerals reserved.....	286,046	1,232,099
Coal only reserved.....	5,266	10,835,853
Some named minerals reserved.....	22,039	1,845,351
Total.....	718,704	47,152,772

Summary of mineral land withdrawals and classifications outstanding on June 30, 1941

Class	Withdrawn	Classified	Total
	<i>Acres</i>	<i>Acres</i>	<i>Acres</i>
Coal.....	24,017,364	¹ 34,925,945	58,943,309
Oil.....	² 4,859,154	71,884	4,931,038
Oil shale.....	5,989,949	4,081,208	10,071,157
Phosphate.....	1,889,601	302,219	2,191,820
Potash.....	9,411,906		9,411,906
Metallic minerals.....	8,507		8,507
Total.....	46,176,481	39,381,256	85,557,737

¹ Includes 5,229 acres of coal land reserved for use of the United States (coal reserves Nos. 1 and 2).

² Includes 13,578 acres withdrawn as helium reserve.



GRAZING SERVICE

R. H. RUTLEDGE, Director

WITH the national emergency focusing attention on the food-producing resources of the Nation, the Grazing Service during the past fiscal year extended its efforts to obtain the maximum output of food and other essential products from the Federal range while at the same time preserving the basic resources from which an important share of these commodities is obtained.

While the struggle in Europe is primarily one between the dictatorship and the democratic form of government, there is beneath it all a conquest for the control of resources. The outcome of the present war will depend largely upon the success or failure of the aggressor in his conquest for control of resources. The manner in which we utilize and manage the Federal range is a vital factor in America's future, and is of immediate importance in the supply lines for the factory, the assembly line, and the training camp.

We know how seriously the warring nations have had to cut into their basic food-producing resources. The cattle herds in many countries are practically wiped out. The slaughter of foundation livestock in the occupied countries in Europe eventually will cause the world to look more and more to the United States as a source of breeding stock. Wise use, management, and conservation of the Federal range will enable our western livestock operators

to contribute their share to world reconstruction when the time comes.

It is now an established axiom in national conservation that the public domain ranges must be handled so as to assure forage for livestock and at the same time make certain that the mistakes of overstocking made during the First World War shall not be repeated. This means that the 142,000,000 acres of public range in 10 Western States must be used wisely and efficiently this year, next year, and for years to come. It means defense against waste of soil, water, and forage to safeguard investments in education, irrigation, power, livestock, and other enterprises. It means local and national planning in terms of present and future needs. It means that we must center our efforts around range problems in relation to our established livestock economy, keeping in mind the unusual demands on the range to meet emergency requirements.

About 50 percent of the sheep and nearly 20 percent of the cattle produced in the United States use the Federal range during part, at least, of their growing period. The forage and water on these ranges, therefore, contribute a goodly share of the meat, leather, wool, mohair, and the hundreds of byproducts that are indispensable to human welfare.

The grazing districts established under the Taylor Grazing Act embrace nearly 260,000,000 acres of Federal and non-Federal land on which is produced at relatively low cost a goodly share of the 18,000,000,000 pounds of meat consumed by Americans each year. The forage of the range is the raw material for this important production line.

Grazing Service Moves West

To assist in the President's plan to create more office space in Washington for agencies working directly on defense activities, the Grazing Service headquarters was transferred to Salt Lake City, Utah, on June 19, effective August 1, 1941. Salt Lake City is at the geographical hub of grazing district activities in the West. From the standpoint of range management and operation, this transfer will effect closer cooperation between the stockmen who use the public range and the Grazing Service in conducting its program on the ground.

New Uses of Public Lands

The need for areas in which to prepare for modern-day defense again focused national attention on the public domain. During the

year the Grazing Service cooperated with military and civilian arms of the Government in the establishment of bombing ranges, rifle ranges, aerial combat ranges, aerial combat training grounds, maneuver areas, air navigation sites, and munitions dumps, involving about 5,000,000 acres of public land in Nevada, Arizona, New Mexico, Utah, and Oregon. Special use areas were recommended by the Grazing Service for community, State, and Federal needs in grazing districts for civilian target ranges, travel check stations, storage sites for Federal agencies, and administrative sites to coordinate unusual activities resulting from the defense effort.

Organization

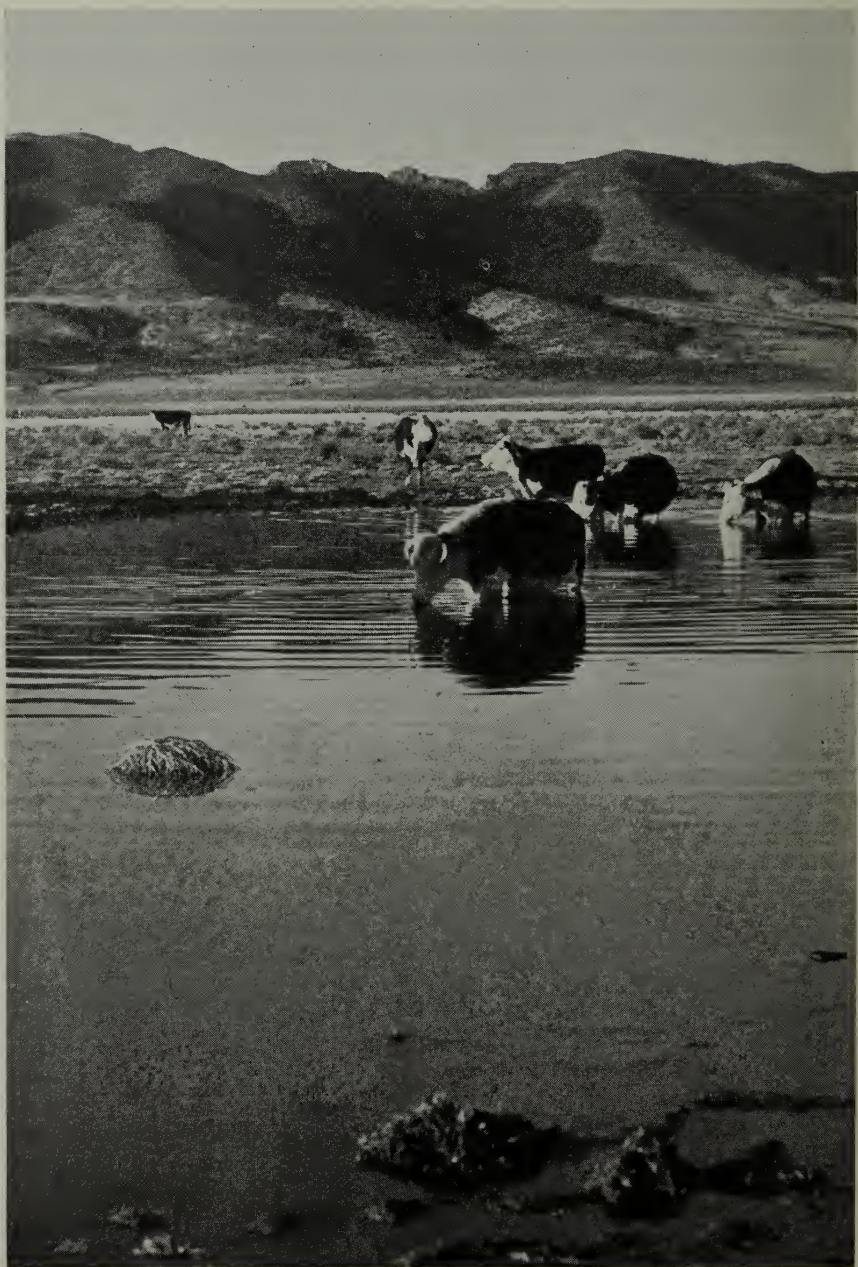
Seven years ago the great "grazing commons" of the West was put under Federal supervision by the Taylor Grazing Act of 1934. In that time the principal arterial routes of administration have been laid out and many laterals finger out from them—but unnumbered trails, as yet uncharted, remain to be blazed.

Progress would have been slow without the cooperation of the stockmen and the local advisory boards. This type of citizen cooperation has joined the forces of range users and administrative men in a mutual conservation effort. A total of 582 district advisors assisted with the program during the year.

The services of practical stockmen are being taken advantage of more and more in the planning end of range conservation. During the year, there was organized voluntarily a National Advisory Council of Stockmen, composed of two members from each of the nine range regions to coordinate problems of range conservation with national defense and to further the interest of the licensees and permittees in grazing districts. This council offered its services to the Secretary, should he need them on matters of public interest in the range country.

By streamlining the administrative set-up under the branches of Operations, Range Management, Land Acquisition and Control, and Range Improvements and Maintenance, the Grazing Service was enabled to perform a better public service despite the expanded program.

The branch of operations correlates the general administrative program and supervises the business procedure including personnel, equipment, and budget matters. The work of the other branches is concerned primarily with the action program. Coordinated in the Director's office the whole program is conducted by the direct flow of authority and responsibility from the Secretary in Washington to the range rider in the outposts of the grazing district.



CONSERVATION SLAKES CATTLE THIRST

Water for livestock is an indispensable factor in the use of the Federal range comprising 142,000,000 acres in 10 Western States. During the past 6 years, the Grazing Service has built 297 reservoirs and 534 other water control structures, drilled 297 wells and developed 644 springs for the benefit of the 12,000,000 animals using the areas set aside under the national conservation program.

Operations

Administrative funds, provided by Congress for the fiscal year, totaled \$750,000. This amount includes funds for the payment of per diem and travel expenses of district advisors. The action program was expanded by the allotment of \$741,298 from the Office of the Secretary to conduct soil- and moisture-conservation work in grazing districts under provisions of the President's Fourth Reorganization Plan.

The Taylor Grazing Act provides that 25 percent of grazing fees collected shall be made available when appropriated by Congress for construction, purchase, and maintenance of range improvements on the public lands and that 50 percent of fees collected shall be paid to the States affected for expenditure as the respective State laws may prescribe. Most of the States have passed laws whereby funds received from this source may be donated to the Secretary for range improvements in cooperation with the local advisory boards.

Earned grazing fees in grazing districts during the year are shown by States as follows:

Arizona.....	\$44, 284. 14	New Mexico.....	\$177, 845. 38
California.....	33, 369. 70	Oregon.....	72, 766. 69
Colorado.....	45, 523. 07	Utah.....	155, 708. 72
Idaho.....	77, 863. 22	Wyoming.....	138, 862. 33
Montana.....	34, 561. 60		
Nevada.....	141, 669. 78	Total.....	922, 454. 63

Of this amount \$231.47 represents money deposited to the credit of the Indians and \$460,995.84 is deposited for payment to the States affected under provision of the Taylor Grazing Act, bringing the total State revenues from this source to \$1,813,421.74 during the 6-year period 1936 to 1941.

To comply with decisions of the Comptroller General, it was necessary to effect a change in accounting practices in which all collections of fees pertaining to grazing lands are deposited with the Treasury pending a transfer to the appropriate receipt accounts. The new accounting procedure for grazing fees installed during the fiscal year has reduced materially the clerical work and has greatly facilitated the distribution of fees collected. The prompt payment of the States' shares of the grazing fees collected each fiscal year will be facilitated by this change in procedure.

The action program of the Service was enlarged substantially by the establishment of additional grazing districts; by the assumption of added duties conforming to cooperative arrangements with various bureaus of the Department; and by expanded soil- and moisture-conservation activities prescribed in the President's Fourth Organization Plan.

On April 10, 1941, the first Assistant Secretary approved a plan for the reorganization of the CCC technical and engineering units.

This involved the abolishment of the Salt Lake City field engineering unit and the assignment of engineers to the various regional offices. The regional office staffs, thus, were strengthened by closer supervision of range improvements in direct relation to range management.

As a result of the President's fourth reorganization plan, 100 civil-service employees were added to the staff. There was a decrease of 93 CCC personnel occasioned by the reduction of camps. Two Grazing Service camps were transferred to the Army for defense purposes, while one was transferred to the Fish and Wildlife Service, and two to the Bureau of Reclamation for work created by the Case-Wheeler Act. At the end of the fiscal year 1941, there were 1,140 employees in the Grazing Service, of whom 740 were CCC employees engaged on the range development program. Only 64 of the 1,140 were assigned to the Washington headquarters' staff.

Lands

During the past fiscal year, four additional grazing districts were established by order of the Secretary of the Interior—two in Colorado



WOOL ON WAY TO WEARER

Seasonal movements for more than 10,000,000 sheep from range or ranch to market must be provided for in the Federal range conservation program of the Grazing Service. More than 1,100 miles of stock trails and 8,000 miles of truck trails built in the 142,000,000-acre Federal range facilitate orderly use of the conservation areas.

and one each in Idaho and New Mexico, bringing the total number of grazing districts to 57. The gross area in grazing districts is now 266,006,200 acres, of which 136,338,100 acres is vacant public land chargeable against the 142,000,000-acre limitation in the Taylor Grazing Act as amended.

Fifty orders of modification were approved, resulting in the addition of about 3,000,000 acres of land to grazing district areas and the elimination of approximately 250,000 acres for air navigation sites, reclamation projects, canalization projects, wildlife, recreational, and Indian needs. Fifteen thousand acres of stock driveway withdrawals were revoked and the land placed under grazing district administration.

Pierce Act

The Pierce Act of June 23, 1938, authorizes the Secretary of the Interior to lease on behalf of the United States, State, county, corporation, and private lands in grazing districts which have been determined by him to be chiefly valuable for grazing. In turn, he is authorized to issue permits for the use thereof to qualified applicants. Such lands are thus given protection under the Taylor Grazing Act and the revenue they produce is paid to the lessor.

Leases of State and county-tax-delinquent land under this act involving about 10,000,000 acres are being negotiated in the 9 western regions. In the State of Oregon, two county leases and one State lease totaling approximately 1,000,000 acres were approved and placed in operation during the year.

Land Classification

At the beginning of the fiscal year, there were 347 applications pending in grazing districts for rights-of-way, homestead, exchange, sale, and lease. During the year, 494 cases were received, making a total of 841. Of this number 494 were disposed of by appropriate action leaving 347 applications pending at the close of the fiscal year. Approximately 7,000 acres in 9 States were included in public water reserves, and approximately 700 acres were excluded, increasing the outstanding area in public water reserves in 12 Western States to 518,000 acres. Ten special use permits to motion-picture companies were approved during the year and numerous favorable recommendations were made for business, home, and recreational sites under regulations pertaining to the 5-acre tract law of 1940.

Land Planning

Progress in land planning, as a foundation for stability in the livestock industry, continued as an important part of the program during

the year. The land planning program of the Grazing Service takes into account not only the public lands, but also the intermingled private and State lands which total more than 121,000,000 acres in the 57 grazing districts. Studies made during the year confirmed the policy of the Grazing Service for consolidation of land uses wherever possible to promote the over-all conservation program. This is accomplished through cooperative agreements with agencies, States, groups, counties, corporations, stockmen's associations, and individuals.

Cooperation

Cooperation with other Federal agencies, local groups, individuals, railroad companies, States and counties reached a new high during the fiscal year just closed. Prior agreements with the Bureau of Reclamation, the National Park Service, the Fish and Wildlife Service, of the Department of the Interior and the Soil Conservation Service, and the Forest Service of the Department of Agriculture were continued during the year. Disposal of problems involved under appropriate land laws was expedited through continued cooperation with the General Land Office. Protection of woodland areas in grazing districts was effected through cooperative agreements between the Division of Investigations, the General Land Office, and the Grazing Service.

Mapping Activities

The preparation of base maps and status maps kept pace with field work on land classification, range management, and range improvement. Facilities of the drafting offices at Salt Lake City, Reno, and Albuquerque were used extensively by State and Federal agencies. The Grazing Service furnished base maps of key areas vital to the plans of the War Department. Advancement was made in aerial photography through cooperation with the Forest Service and the Agricultural Adjustment Administration. Through a cooperative agreement with the latter agency, the Grazing Service was enabled to participate in three extensive contracts for aerial photographic service in Montana, Idaho, and Utah, and maps based on data thus obtained were made available to the Grazing Service at a minimum cost.

Status of Grazing Districts

The area of public land administered by the Grazing Service during the year totaled 144,873,200 acres. Approximately 8,535,000 acres of this total is included in public withdrawals for power, reclamation, naval oil stores, and other areas held in reserve for future needs. Thus, lands in grazing districts withdrawn for other purposes are beneficially

used and conserved pending the time when they are put to the uses for which they were specifically set aside.

The break-down of land ownership in grazing districts is shown on Table 1.

TABLE I.—Status of grazing districts, approximate acreages, June 30, 1941

State	Number of districts	Gross area	Vacant unappropriated public land ¹	Other public land ²	Total administered by Grazing Service	Other land ³
Arizona.....	4	15, 219, 800	9, 748, 900	595, 700	10, 344, 600	4, 875, 200
California.....	2	8, 072, 800	3, 423, 400	625, 200	4, 048, 600	4, 024, 200
Colorado.....	7	19, 021, 400	7, 494, 100	666, 900	8, 161, 000	10, 860, 400
Idaho.....	5	22, 067, 600	11, 513, 900	486, 500	12, 000, 400	10, 067, 200
Montana.....	6	32, 045, 900	4, 885, 100	1, 174, 100	6, 059, 200	25, 986, 700
Nevada.....	5	48, 000, 800	34, 955, 500	471, 100	35, 426, 600	12, 574, 200
New Mexico.....	7	39, 742, 000	15, 106, 400	753, 200	15, 859, 600	23, 882, 400
Oregon.....	7	20, 294, 900	11, 919, 700	68, 500	11, 988, 200	8, 306, 700
Utah.....	9	39, 034, 900	24, 331, 000	2, 616, 400	26, 947, 400	12, 087, 500
Wyoming.....	5	22, 506, 100	12, 960, 100	1, 077, 500	14, 037, 600	8, 468, 500
Total.....	57	266, 006, 200	136, 338, 100	8, 535, 100	144, 873, 200	121, 133, 000

¹ Represents vacant unappropriated public land chargeable against the 142-million-acre limitation in the Taylor Grazing Act as amended.

² Represents public land withdrawn or reserved for other purposes but which is administered by the Grazing Service under agreements.

³ Mainly State, private, railroad grant, county, and other prior Federal withdrawals.

Range Management

The year 1941 was a banner year in the range livestock business due mainly to improved prices, favorable weather, controlled use of the range, and stability fostered by the Taylor Grazing Act. Steady progress was made in the grazing districts toward elimination of faulty range practices and marked benefits accrued to formerly congested areas by the transfer of surplus stock to ranges that formerly were underused. This was made possible by building trails to inaccessible areas and the development of stock water. Willful violation of regulations showed a marked decrease and many readjustments of stock movements, season of use, and class of livestock were worked out to the benefit of the range itself, and the livestock operators generally.

Long-term grazing permits to replace temporary licenses of previous years were made ready for issuance to approximately 60 percent of the operators. This important step was made possible through the accumulation of pertinent facts upon which to base administrative action, and the cooperation of livestock operators themselves. The number of licensees and permittees was increased by 934 (about 5 percent) over the previous year. On the other hand, the total number of livestock was less than the number that grazed the ranges during the previous year. This condition is due in some measure to reductions that were put into effect on depleted areas, but for the most part it was due to the fact that many stockmen took advantage of prevailing favorable prices and disposed of surplus livestock.

Available information indicates that a greater total weight of live-stock and its products was produced on these ranges than was produced during the previous year. In some areas the weight gains made from Federal range compared very favorably to gains made in feed-lot operations during similar periods, especially in the South-west where rainfall was exceptionally favorable.

With the protection and improvement of ranges the trend in the livestock industry is leading steadily toward "more pounds" and away from "more numbers." Better range conditions in grazing districts were reflected also in increased weights of fleeces, better lamb and calf crops, and a material reduction in death losses. In turn, there was a general increase in ranch values, all of which combined to strengthen the local economy and promote optimism in the range livestock business.

The summary of Federal range livestock use in the 10 States is given on Table 2.

TABLE 2.—Summary of livestock use of grazing districts, fiscal year 1941

State	Number of districts	Number of licenses	Cattle	Horses	Sheep	Goats	Total livestock
Arizona.....	4	596	74,533	3,197	241,295	30,441	349,466
California.....	2	675	69,945	3,347	235,215	1,161	309,668
Colorado.....	6	1,707	155,082	8,984	701,877	95	866,038
Idaho.....	5	3,694	173,150	15,377	1,386,870	76	1,575,473
Montana.....	6	1,389	119,404	19,101	856,730	29	995,264
Nevada.....	5	1,958	257,799	13,686	1,090,290	2,820	1,364,595
New Mexico.....	7	3,343	253,820	21,234	652,582	92,875	1,020,511
Oregon.....	7	1,355	160,468	11,706	410,287	0	582,461
Utah.....	9	5,281	183,114	10,060	2,066,423	17,752	2,277,349
Wyoming.....	5	1,545	153,961	14,371	1,569,809	271	1,738,412
Total.....	56	21,543	1,601,276	121,063	9,211,378	145,520	11,079,237

Soil and Moisture Conservation

The act of April 27, 1935 (49 Stat. 163) recognizes soil erosion as a menace to the national welfare and provides for control and prevention of soil erosion, the preservation of natural resources, the control of floods, the protection of reservoirs, the maintenance of the navigability of rivers and harbors, and the protection of public lands. Reorganization Plan No. IV, dated April 11, 1940, transferred the activities of the Soil Conservation Service relating to soil and moisture conservation on Interior Department lands from the Department of Agriculture to the Department of the Interior. This transfer confirmed the principle that such functions are the responsibility of the agency administering the land.

Effective November 1, 1940, the Office of Land Utilization of the Department of the Interior allotted to the Grazing Service funds, personnel, and equipment with which to fulfill prior obligations of the

Soil Conservation Service within the boundaries of grazing districts and to initiate new projects therein. Despite the fact that the obligations were assumed 4 months after the beginning of the fiscal year, most of the work entailed was completed and new work was initiated on 46 projects, affecting 5,530,000 acres in the 10 States. Other work under this authority was conducted in connection with range management and range improvement, involving water development, water spreading, diversion ditches, range reseeding, contour treatment, and range surveys on 4,936,100 acres.

The conservation of soil and water basically expresses the underlying objective of any land-management program. From the beginning of grazing district administration in 1935, the Grazing Service has designed its improvement projects primarily for the conservation of soil and moisture to the extent of available funds. The allotment of specific funds in 1941 for this purpose enabled the Grazing Service to greatly expand its activities in this connection, resulting in definite benefits to the public lands. Soil and moisture funds serve two main purposes: (1) they provide a broader development program for relief in critical areas, and (2) they afford effective work on remote areas formerly out of practical reach of camps and side camps. Wherever possible, local people were employed on projects of local interest, mainly on spring development, fencing, reservoir construction, and related development work.

Soil and moisture conservation on grazing land is accomplished primarily by applying proper range-management practices in connection with a planned program of structural improvements. This has enabled the Grazing Service to combine practical administration with the more technical phases of soil and water conservation. To fulfill this objective special attention was given to range surveys to determine the over-all plan of range management and policies that will promote stability in range livestock operations.

Term Permits

Effective at the end of the fiscal year, long-term grazing permits were issued to approximately 60 percent of the stockmen formerly operating under a temporary license system, thus enabling the stockman, the banker, and the Grazing Service to plan together for a permanent livestock economy.

Range Surveys

The Range Survey Unit continued to map and inventory the range resources as a basis for present and future action, involving the survey of 22,000,000 acres during the year. Progress in this connection

is indicated in the following summary which shows the gross area covered and necessarily includes non-Federal land with which the public land is intermingled.

Survey of public range

[Data reported by number of townships; 1 township=23,040 acres]

Completed prior to 1940.....	3, 814½
Completed during fiscal year 1940.....	958¼
Grand total completed.....	4, 773½
Size of job.....	12, 436
Percent complete.....	38

Examination of 1,268 dependent properties to determine the nature and extent of range privileges to which the occupants are entitled were completed during the year. The number examined to date totals 11,699 ranch units—a little more than half of the total number of record to be examined.

Range Studies

Range studies were continued on a cooperative basis on three major projects:

(1) Squaw Butte Range Station, Oregon—16,000 acres—Cooperator, Oregon State Agricultural College.

(2) Golliher Pasture Experimental Range, Nevada—25,000 acres—Cooperator, University of Nevada.

(3) Elko County Economic Study, Nevada—12,000,000 acres—seven Federal and State agencies participating. Field work on this latter project was completed during the year. Analysis of data and preparation of a report for possible publication as a joint enterprise of the participating agencies is contemplated. Among other things, the results of this study will show the economic relationship of ranch and range in a typical Federal range area.

During 1941, 65,381,000 acres were covered by utilization checks in cooperation with the range users to determine results of controlled use of various range allotments, and the effectiveness of all factors involved in management plans.

Fire Control

The range fire hazard increased over the previous year due to a more luxuriant growth of forage. A total of 699 fires burned over 744,218 acres. Most range fires are due to carelessness along highways. For this reason the Grazing Service is using every means at its disposal to impress on the traveling public the need for caution. Only 6 fires totaling 50 acres were due to incendiarism.

Reseeding

About 66,000 acres in several districts were reseeded during the year, bringing the total area thus treated to 148,376 acres.

On the basis of field trials undertaken in previous years, and with the guidance of previous reseeding experiments by States and other agencies, the Grazing Service laid plans to seed about 500,000 acres of depleted Federal range during the coming year.

Favorable weather conditions brought forth a wealth of native seed from desirable forage species. Thousands of pounds of native plant seeds were gathered for this purpose.

Hearings and Appeals

The number of local hearings increased slightly over the previous year. Most of the controversies for range rights were settled on the ground by agreement. Only 10 cases were taken to the Secretary on appeal from the examiner's decision.

On May 26, 1941, the Supreme Court of the United States, acting upon the appeal in the case of *Dewar vs. Brooks* (No. 718, October term, 1940), upheld the validity of the temporary grazing license system and the charging of fees therefor pending the issuance of 10-year grazing permits under the Taylor Grazing Act, reversing the judgment of the Nevada Supreme Court which held the temporary license system illegal. The opinion delivered by Mr. Justice Roberts held that the repeated appropriations of the proceeds of the fees covered into the Treasury in the administration of the act, not only confirmed the departmental construction of the statute but constituted a ratification of the action of the Secretary as the agent of Congress in the administration of the act.

Federal Range Code

Two meetings, one at Denver, Colo., and one at Salt Lake City, Utah, were held during the year with the National Advisory Board Council to perfect the Federal Range Code. The results of discussions and recommendations were given thorough consideration by the Department and by Grazing Service officials and as a result the code is in the process of being rewritten.

Range Appraisal

Grazing fees of 5 cents per animal unit a month are collected from all Federal range users. To evaluate the position of the Federal range

with respect to other lands in grazing districts, the Grazing Service inaugurated a systematic range appraisal during the year. Factual data on land taxes, carrying capacities, rental fees, and ranch cost and income data were obtained from representative ranches in each grazing district. Range appraisal samples of the Federal range were studied on 437 separate areas within grazing districts. Information was obtained and evaluated on 400,000 acres of commercial base land and tax information obtained on approximately 3,000,000 acres of privately owned grazing land in the 10 States. Ranch cost and income reports were obtained from 215 representative ranches located within grazing districts and 700 grazing units in districts were carefully examined and rated.

Wildlife

The Grazing Service continued cooperation with the Fish and Wildlife Service, with States under the Pittman-Robertson Act, and with other interested agencies and groups to promote the welfare of wildlife using the grazing districts. New agreements that developed better coordination in the administration of game ranges were entered into during the year. On the basis of sample game counts made in various districts during the year, it is estimated that approximately 335,000 big game animals used the Federal range in common with livestock. Efforts were made to reserve adequate forage carrying capacity for these animals when not inconsistent with the broad purposes of the act.

Range Improvements

The range improvement program radiating from CCC camps centered principally around construction work at strategic points on the range and enabled the Grazing Service to prosecute its over-all range improvement program with uniform efficiency. To obtain these results, the work program was subdivided into five main classifications: (1) projects to increase forage growth, (2) water development and conservation, (3) projects to facilitate control and orderly use of the range, (4) projects to protect the soil itself, and (5) projects to counteract destructive elements. In addition, more attention was given to the problem of maintenance of existing range improvements. In cooperation with the livestock industry through the local advisory boards and with the National Resources Planning Board, a well-rounded 6-year program covering all grazing districts was projected on maps and included as a part of the national plan. The major accomplishments of range improvements and development are listed on Table 3.

TABLE 3.—Work completed

Type	Unit	Fiscal year 1941	Total April 1935 through June 1941
Springs.....	Number.....	210	644
Reservoirs.....	Number.....	121	297
Wells.....	Number.....	49	239
Fences.....	Miles.....	911.7	4,395.3
Cattle guards.....	Number.....	165	560
Corrals.....	Number.....	70	343
Bridges.....	Number.....	48	303
Truck trails.....	Miles.....	1,764.2	8,646.5
Stock trails.....	Miles.....	120.9	1,156.3
Permanent check dams.....	Number.....	1,039	7,465
Temporary check dams.....	Number.....	617	47,935
Water control structures other than dams.....	Number.....	251	534
Rodent control.....	Acres.....	1,773,393	10,099,177
Insect pest control.....	Acres.....	18,496	162,136
Range revegetation.....	Acres.....	66,083	148,376
Tree planting—gully.....	Square yards.....	0	9,580
Diversion ditches.....	Linear feet.....	53,556	262,376
Channel construction.....	Linear feet.....	500	12,541
Water spreaders.....	Linear feet.....	84,194	153,505
Clearing and cleaning channels.....	Square yards.....	63,575	110,820
Pipe and tile conduits.....	Linear feet.....	7,586	244,293
Riprap or paving.....	Square yards.....	2,814	148,168
Fire-fighting.....	Man-days.....	39,463	111,432
Impounding and large diversion dams.....	Number.....	187	1,078

Radio

The installation of radio communication in all regions was completed during the year. By this means, the outlying camps, roving maintenance crews, survey crews, fire crews, and range riders keep in daily contact with regional and district offices.

Maintenance

As the program of range improvement advances, the problem of maintenance is likewise advanced. The man-days, 279,579, required to maintain existing projects in 1941 were 76,687 more than were needed for this purpose in 1940.

Office of Land Utilization

LEE MUCK, Assistant to the Secretary

SINCE its creation in 1849, the Department of the Interior has had jurisdiction over vast land areas. Although more than a billion acres of land have been disposed of, and more than 150,000,000 acres have been reserved for national forests and other purposes, there are still under the jurisdiction of the Department at the present time, approximately 280,000,000 acres of land, exclusive of the Federal lands of Alaska. Once regarded as a real-estate agency, the Department is now a land-management agency on a scale larger and more diversified than any other department of the Federal government.

National Defense

It is significant that in the administration of the public lands under its jurisdiction during this year of rapid transition from a peace-time economy to a period of unlimited national emergency, the Department of the Interior has been able to make important contributions to the national-defense program while maintaining and increasing the conservation gains of the past 8 years. In contrast to the waste and exploitation of public-land forests and misuse and overuse of range lands during the first World War, the public lands administered by the Department today are managed so as to fill all normal needs and accept the challenge for increased use of Federal-land resources in the interest of national defense without disturbing the sound management and conservation policies under which they are handled.

The tremendous forest and land resources under the management of the Department of the Interior are so located and in so available a condition that they are making immediate and substantial contributions to the national-defense program. From the great protected forests and the vast range lands is coming a steady stream of timber, feed, and other products to contribute toward and give impetus to the all-out national preparedness endeavors.

The natural wealth of the United States forms the sinews and muscles of our national defense, and the Department of the Interior

will continue to administer prudently the resources of the Federal property under its jurisdiction so as to satisfy regular present needs and defense requirements, and so control their production that they can meet adequately all future national requirements.

Conservation of the resources of the public land goes far beyond protection of the physical property. The Department of the Interior is ever on the alert to defend conservation laws and policies against attempted break-throughs for quick war profits. A guard is constantly held against efforts designed as patriotic enterprises for use of natural resources, but which in reality are destructive to all conservation principles and represent attempts to "blitzkrieg" conservation fortifications in the interest of personal gains.

In addition to meeting all present conservation requirements, the Office of Land Utilization is already making plans for a greatly expanded management and conservation-development program for the public lands at the end of the present emergency period. Such a program may be the springboard from which one segment of public-works employment can be launched to help take the shock out of the transition from the present era of national preparedness with its accompanying high rate of employment.

Large areas of public lands administered by the Department of the Interior occur in all parts of the United States, but principally in the West where they constitute high percentages of the total land area of most of the States. The character of these lands is far more variable than that of any other Federal lands, ranging all the way from bare desert land to primeval forest, and from practically worthless waste areas to priceless masterpieces of nature's best productions.

This wide range of conditions has resulted in a corresponding diversity of aims and purposes in the administration and management of these lands and explains why different administrative agencies, in compliance with congressional actions through the years, have been created to handle them. The following table lists the principal administrative units of the Department of the Interior having responsibilities in land management and the estimated total land area under their administration in the continental United States:

Administrative Unit:	Total land area (acres)
Grazing Service.....	138, 706, 154
Office of Indian Affairs.....	55, 453, 959
General Land Office.....	51, 844, 338
National Park Service.....	13, 601, 981
Bureau of Reclamation.....	12, 553, 847
Fish and Wildlife Service.....	4, 215, 876
Oregon and California Revested Lands Administration.....	2, 680, 000
Total.....	279, 056, 155

In addition to the above, the General Land Office is charged with the administration of more than 324,000,000 acres of public domain in Alaska, where also there are nearly 6,000,000 acres in national parks and monuments, 820,000 acres of Indian and native reservations, and more than 4,000,000 acres in wildlife refuges.

New Office of Land Utilization

Because of the tremendous responsibilities entailed in the administration of the vast land area under its jurisdiction, and the necessity for an all-inclusive coordinated approach to the land-management problems involved, the Office of Land Utilization was established and began to function during the fiscal year 1940 as a unit in the Office of the Secretary of the Department of the Interior. Order No. 1466, issued April 15, 1940, by Secretary of the Interior Harold L. Ickes, reads, in part, as follows:

There is hereby created in the Office of the Secretary the position of "Assistant to the Secretary in Charge of Land Utilization."

The Assistant to the Secretary shall be charged with the responsibility of coordinating and integrating the land use activities of the several bureaus of the Department and the supervision and maintenance of relationships with other Governmental agencies, Federal, State, or local, as well as private, essential to the proper development of the conservation program of the Department. His function shall be planning and coordinating.

In general the conservation policy of the Department of the Interior calls for the management of the land resources under its jurisdiction according to the most practicable techniques suited to the particular resources and to the purposes for which Congress set aside the several categories of land. The well-established conservation theory of optimum use for the greatest public benefit is the guiding principle throughout the Department of the Interior, in which conservation received its first official Government recognition. While cognizant of the national character of the ownership of the large estate, the rights of local communities are fully recognized and provided for. Furthermore, the management of all resources under its jurisdiction, except where made impossible by congressional limitations as on the national parks, is conducted well within income.

Immediately upon its organization the Office of Land Utilization entered upon its duties of coordinating the functions and activities relating to land management and conservation work of all bureaus administering public lands in accordance with the general conservation policies of the Department.

It should be pointed out in this connection that the idea of a coordinated approach to public land-management problems was not new in the Department. Since July 1, 1939, when the Office of Director of Forests was created, all forestry work has been carried

out under a coordinated plan developed by the Director of Forests in cooperation with the several agencies engaged in administering forest resources. As a result, basic conceptions of a broad management program for public lands already were well advanced and being carried out on forest lands at the time the Office of Land Utilization was organized.

Consequently, the Office of the Director of Forests was logically the foundation around which the more inclusive Office of Land Utilization was built. Here the coordinated forestry program of the Department is conducted as before, except that it was greatly strengthened and implemented during the past year by virtue of its important position in the much broader land-management program initiated for all Interior lands.

New and Enlarged Responsibilities

At the beginning of the fiscal year 1941 the Department was given new and enlarged responsibilities with regard to the conservation and management of the resources under its jurisdiction. The President's fourth plan on Government reorganization, issued April 11, 1940, and made effective on July 1, charged the Department of the Interior with the development and carrying out of all activities having to do with soil and moisture conservation work on the public land which it administers. Section 6 of the Fourth Reorganization Plan reads as follows:

Certain functions of the Soil Conservation Service transferred.—The functions of the Soil Conservation Service in the Department of Agriculture with respect to soil and moisture conservation operations conducted on any lands under the jurisdiction of the Department of the Interior are transferred to the Department of the Interior and shall be administered under the direction and supervision of the Secretary of the Interior through such agency or agencies in the Department of the Interior as the Secretary shall designate.

While the bureaus and agencies of the Department of the Interior for many years have carried out such soil and moisture conservation work as their regular funds would permit, this transfer represents a major forward step in the field of effective public administration and recognizes the principle that both planning and field operations for soil and moisture conservation work are the responsibility of the Department administering the land. It has made possible the effectuation of an over-all coordinated land-management program designed to reach all categories of public land under a master plan promulgated on a department-wide basis. For the first time in the history of public land administration, funds and personnel were made available for putting into immediate operation an all-inclusive program for the conservation and management of all public lands in the

United States and Alaska under the jurisdiction of the Department of the Interior.

In order to attain the aims and objectives of section 6 of the Fourth Reorganization Plan as rapidly and efficiently as possible, the authority for the expenditure of funds received for soil and moisture conservation work was vested in the Office of Land Utilization. Likewise, all personnel engaged in carrying out the broad soil and moisture conservation field activities were attached directly to the Office of the Secretary of the Interior and assigned by the Office of Land Utilization to the several bureaus administering public lands.

The first major task faced by the Office of Land Utilization was the conveyance in Washington and in the field of personnel, supplies, monies, and equipment involved in the transfer of soil and moisture conservation activities on public lands to the Department of the Interior from the Department of Agriculture. The personnel involved in the transfer consisted of 447 individuals, and the funds transferred amounted to \$2,302,500. In addition considerable quantities of equipment such as automobiles, trucks, tractors, office furniture, and numerous smaller items were inventoried and inspected before being taken over by the Department of the Interior.

Soil and Moisture Conservation

The principal erosion problems on lands administered by the Department of the Interior are found on the grazing ranges, the unreserved and unappropriated public domain, and the Indian reservations, which combined make up the major portion, approximately 250,000,000 acres, of the federally owned land in the western United States. A limited erosion problem exists also on lands formerly overgrazed or otherwise misused, which have been incorporated in the national parks and monuments, and wildlife refuges, as well as on irrigation lands included in Reclamation projects. Through the long period of years when the Government policy was to transfer public lands to private ownership, there was neither authority nor funds with which to protect adequately the forest and other landed resources under the jurisdiction of the Department of the Interior.

During those years the general attitude of the public in regard to the use of the Federal lands was one of indifference. The belief prevailed that since these lands were the property of the entire citizenship they could be used at will on an all-out "first come, first served" basis. The inevitable result of such an attitude was that improper land use brought about a serious state of deterioration on millions of acres.

In recent years, however, the Government's policy toward the lands in public ownership, as reflected in legislation, became one of

prudent management, and the Department of the Interior is now faced with an enormous job of rehabilitation.

Land-management specialists of the Department of the Interior have known for a long time that the most efficient and enduring type of conservation can be attained only when adequate and effective erosion-control treatments are placed, where needed, on a watershed basis. Experience has taught that the effectiveness of such measures will be short-lived unless they are protected from the sweep of uncontrolled run-off from adjacent areas. Accordingly, it was decided early that master working plans based on surveys conducted by the bureaus in cooperation with the Office of Land Utilization and other agencies, necessarily must be formulated on the basis of entire watersheds. The next determination was that work projects set up and carried out on Interior lands within established watershed units must be conducted in full conformity with the master plan covering all public lands in the Western States.

Other coordinating policies established at the start of the fiscal year were: (1) Conservation projects previously initiated on Interior lands, and which were not completed as of the date of the transfer of activities, would be continued at a rate consistent with available funds pending an examination of the situation and the formulation of complete conservation working plans; (2) interdepartmental and interbureau agreements would be authorized for conducting soil and moisture conservation operations when such agreements were found to be in the interest of the over-all program; (3) a high degree of cooperation would be maintained by Department of the Interior bureaus administering the public lands within the boundaries of State Soil Conservation Districts with the officers of such districts; (4) close working relationships would be developed and maintained between the various land-management bureaus and agencies outside the Department engaged in similar soil and water saving activities on privately owned land. The principal objective in this arrangement is the elimination of overlapping and duplication of effort and the promotion of sound conservation practices and accomplishments on all lands—private, State, and Federal—in the Western States. These cardinal principles were adhered to throughout the planning and coordinating work conducted during 1941.

The coordinated program for the conservation of natural resources does not imply nonuse or hoarding. The departmental conservation policy, as interpreted into an integrated action program by the Office of Land Utilization, means: (1) Sound present use and management of the public lands for the benefit of all the people; (2) practical administration that fits wise use of the land into the day-by-day economic problems of individuals, families, groups, and sections of the country that are directly dependent upon Federal land for a livelihood; (3)

management of the land in such a way as to utilize its inherent productive capacity, while protecting its basic national economic value for the needs of future generations; (4) observance of democratic principles in the use and administration of the Federal estate through cooperative application of the experience and knowledge of practical land users in devising and carrying out field operations.

In many cases, the personnel transferred to the field staffs of the different bureaus were kept on projects already under way on lands under the jurisdiction of the Department. These employees were thus enabled to continue field operations on the basis of plans which they themselves may have had a hand in making until such time as these projects could be brought into the master plan of conservation evolved by the Department. As the over-all watershed plans gradually unfold, the work on the existing projects is being integrated into the broader and more inclusive aspects of the new program.

Another factor which contributed greatly to the rapid beginning of field action was the fact that the new conservation endeavor in no way conflicted with or curtailed the regular bureau operations, but rather became a companion undertaking that served as a means of enlarging and strengthening types of activity with which the personnel was entirely familiar.

In expanding the conservation functions and activities of the several bureaus of the Department concerned with land management, emphasis was placed on the adoption and employment of those practical, down-to-earth, and inexpensive control measures and practices which best met the erosion problems of the public lands. Such methods are desirable when viewed for example through the eyes of the practical stockman, who might be interested in adopting them into his own ranching operations.

The aim of this field program is to create, so far as possible, those normal conditions on the land that will allow a resumption of Nature's curative powers in protecting and healing areas denuded of vegetation or otherwise severely damaged by years of improper use. Particular stress is placed on securing stabilization of the land. Once the vast areas of public land in the Western States are stabilized, the natural processes of erosion will become a friend instead of an enemy to the land. All soil and moisture conservation measures advocated and used by the Department of the Interior during 1941 were designed to assist in and speed the attainment of this desired stabilization.

The Office of Land Utilization and the bureaus of the Department at no time have been unmindful of the rights and needs of downstream water users when formulating and carrying into practice plans for upstream soil and moisture conservation work to check the inroads of erosion. The purpose has not been to hold all rainfall on the land where it falls, or to keep water out of streams. The object has been,

however, to so control the movement of run-off water across watersheds as to eventually lessen flash run-off and flood hazards, and thereby maintain steadier stream flows, secure better percolation and larger underground water supplies, and keep silt and other erosional debris from being swept into stream channels, drainages, and irrigation canals.

In planning and carrying out field operations for soil and moisture conservation during 1941 special stress was placed on the development and use of measures and practices that would attain the desired goals without disturbing the family and group economy of the people who lease and depend upon the use of Federal lands for a partial or total source of their livelihood.

The opportunity offered for the coordination of land-management efforts in the West by attacking the land problems on a broad watershed basis was brought out by an ownership study of land included in 170 soil conservation districts in 14 states. The survey indicated that of 77,900,431 acres within district boundaries, 17,545,945 acres, or approximately 22.5 percent, were public lands administered by the Department of the Interior. Seeing the possibilities that such a checkerboard pattern of ownership afforded for securing protection of all land, both public and private within a watershed, the Office of Land Utilization has started working relationships with State soil conservation committees in all of the Western States. At the same time preliminary studies have been started in Washington to determine the most effective means of coordinating and integrating land-management programs on the public domain with similar activities carried out on adjacent private property.

An example of the complete coordination effected by the Office of Land Utilization in carrying out the conservation program on Interior lands is shown in the fact that in addition to integrating the work of the agencies in the field the technical resources of the Geological Survey have been brought into play. Through its own research and contact with the research activities of agencies outside the Department, the Geological Survey is currently making available a great storehouse of scientific information upon which wise use and development of natural resources can be based. In addition to supplying data already compiled on geologic and hydrologic conditions bearing on immediate field problems, the Survey is requested from time to time to conduct field work necessary to collecting and analyzing similar information on particular project areas.

Forest Conservation

The Department of the Interior during 1941 made outstanding contributions in the field of forestry by continuing to push forward the coordination of activities of the several administrative units of

the Department concerned with forest administration and management. Particular attention was given by the Office of Land Utilization to the correlation and integration of the enlarged public land conservation work with the already well-planned forestry program in order to develop a master plan for the conservation use and protection of all the landed resources under the jurisdiction of the Department.

Planning for forestry on a broad scale is primarily a land-use management responsibility. Forest lands under the administration of the Department of the Interior are not only sources and producers of commercial timber for industrial and national defense uses, but they yield also such supplementary resources as forage and wildlife, and they may be important for recreation and watershed protection. Any plans that affect the timber will affect also the use of the other forest resources as well as the future value of the land itself.

Only 3 years ago (1938) the Oregon and California Revested Lands Administration was established with headquarters at Portland, Oreg. It is a field unit of the General Land Office of the Department of the Interior charged with the administrative management of approximately 2,500,000 acres of land, chiefly forest, located in 18 counties in western Oregon. These so-called O. & C. lands include some of the finest stands of virgin timber left in the United States. Conservative estimates place the timber resources thereon in excess of \$75,000,000. Nowhere in this country does there exist a more challenging and promising situation for the practical application of sound principles of forest administration and management.

Despite the short time that these O. & C. lands have been handled under this new administrative setup, sufficient progress has been made to attract Nation-wide attention. Forest owners and operators are beginning to look to these lands for practical guidance in the development of their forest properties. Forest officers and educators are finding interesting lessons and demonstrations in the practical procedures and practices used in the development of this young forestry enterprise.

No phase of the Oregon and California Revested Lands Administration is of greater interest and significance than its financial report. This is explained by the fact that it is one of the very few public forestry agencies in the United States, another being the Indian Forest Service, that operates at present within its own income. In 1941 the income from the sale of timber and other forest products from the O. & C. lands amounted to \$1,102,000, while the amount appropriated for administration and protection purposes was only \$170,000.

During the past 3 years the O. & C. administration has been operating not only within the fiscal limitations prescribed by the act of

August 28, 1937,¹ but in addition actually has developed a surplus of \$148,000, which amount has been returned to the general fund of the Treasury of the United States. This commendable fiscal achievement is unparalleled in American forestry, and especially significant is the fact that it has been accomplished fully within another important provision of the act of 1937, which requires that these lands be handled on the basis of permanent forest production and in conformity with the principle of sustained yield.

The Oregon and California Revested Lands Administration, now appropriately classified as a million-dollar forestry enterprise, has the distinction of being the highest income producing field unit of any public forestry agency in the United States, the next highest being the Klamath Indian Reservation also in Oregon.

Cooperative Sustained-Yield Units

Among the most progressive undertakings in American forestry in recent years is the beginning of the development of cooperative sustained-yield units by the Department of the Interior. In many localities throughout the United States the ownership and jurisdiction of forest lands are so intermingled and interlocking that it is highly impractical and uneconomical to attempt an application of the principle of sustained yield to each separate forest property or each separate administrative unit. Extensive field studies and experiences indicate clearly that a practical and effective means of improving this complex forest-management situation is the formation and operation of cooperative sustained-yield units.

While no cooperative sustained-yield unit has been fully established as yet in the United States, several such units soon will be ready for formal establishment and development. It is noteworthy that other Federal agencies already are following the practice of the Department of the Interior in sponsoring legislation authorizing the creation of similar cooperative forestry units. In 1941 the Oregon Legislature enacted a law giving authority to the State forester to enter into cooperative sustained-yield agreements with other timberland owners and agencies administering timberlands within the State.

Forty applications have been received from timber operators for the establishment of sustained-yield cooperative units. Others would like to engage in such a program but find long-time forest credit loans hard to obtain. The successful operation of such cooperative sustained-yield units will open a new and better way for the practice of American forestry.

¹ The act of August 28, 1937 (50 Stat. 874), provides that 25 percent of the total income shall be available for administration purposes, in such amounts as the Congress shall from time to time determine.

On the national parks the forest cover must by law be kept in its natural condition. This mandate of the law is being strictly adhered to as far as human use for recreation permits. Trails, roads, structures, and camp sites are planned for each park unit as an entity and construction is not undertaken unless approved as being in accord with the master plan laid out for the unit. Forestry problems on the national parks concern the preservation of the forests in their natural state, and their protection against fires, insects, diseases and destructive use, and the provision of proper means for their enjoyment by the public.

Indian forest timber is handled on a commercial basis, stumpage is sold to the highest bidding qualified operators and cutting is conducted by them under the supervision of foresters of the Division of Forestry and Grazing of the Office of Indian Affairs. All cutting is done in accord with policies and regulations designed to assure sustained-yield continuity of timber growth and returns. Management of Indian forests is such as to yield maximum returns, since the Indian forests are private property and the Indians have the status of stockholders in the reservation forests. During the 1941 fiscal year the cost of administration and protection of Indian forests was only \$555,640, while the income from forest sales amounted to \$3,239,294.

There are approximately 23,000,000 acres of forests on the unreserved public domain and in the grazing districts under Department of the Interior administration. At present there is no legislation providing specifically for the managed-use of the forest resources on these lands, nor have adequate funds been made available for their protection and development. On the other hand, these forests are taken into full consideration in the making of coordinated conservation and protection plans for all Interior lands.

Protection against fire continued to be one of the principal forestry activities carried on during the year by the National Park Service, Office of Indian Affairs, Grazing Service, and the O. & C. Revested Lands Administration. Their protective organizations did effective work in preventing and suppressing many fires during the year.

While excellent fire protection was accomplished on the vast acreage of forest lands in Alaska, it is necessary to point out that only \$27,000 was available for this work during the fiscal year 1941. This was \$10,500 less than the small appropriation of \$37,500 that was available for fire protection work in the previous year. This amount was far too small to keep destructive fires from doing considerable damage to valuable timbered areas. During the year 197 fires were dealt with, but there were 83 fires whose existence was reported but upon which no action was taken by the Alaskan Fire Control Service because of their inaccessibility and the very limited personnel that could be employed for fire protection work. Greatly increased funds for the

protection of the forest resources of Alaska, as well as for the development of an all-inclusive program of conservation-development, are needed if the Nation is to guard adequately the tremendous landed resources of the great empire to the North.

Looking Forward

The Office of Land Utilization aims not only to bring about an effective coordination of existing conservation functions and activities, but also to chart a correct course for their future development that will be productive of maximum economic and social benefits to the entire Nation. Among the immediate needs for a satisfactory solution of pressing forestry and range problems on land under the jurisdiction of the Department of the Interior are to:

1. Extend the program for cooperative sustained yield units to cover all forest areas under the jurisdiction of the Department of the Interior.

2. Provide necessary funds for the adequate protection of the valuable forest lands in the national parks and monuments, and for forests on the unreserved and unappropriated public domain and in grazing districts.

3. Authorize the listing and location mapping of the many separate land parcels of the remaining public domain in the United States not included in grazing districts; survey their resources; and prepare plans looking toward the future disposition, exchange, and consolidation and management of these lands.

4. Authorize the sale of timber and forest products from the forests and woodlands within grazing districts.

5. Provide funds for a survey of the forest resources of Alaska, and greatly increase the inadequate fire protection now being given these valuable resources.

6. Continue and intensify the study of all forestry projects of the Department of the Interior operating within income.

7. Continue the expansion of the broad land use and soil and moisture conservation policies of the Department of the Interior in order to develop a completely coordinated administration of the soil and water resources on all the public lands under its jurisdiction in an economic, efficient, and democratic manner.

8. Promote the further coordination and integration of the land management functions and activities of the Department of the Interior in accordance with the master plan designed to reach all categories of public lands with the over-all view of administering and developing the natural resources of the Nation at the highest possible level of efficiency and economy.



NEWTON B. DRURY, Director

NINETEEN FORTY-ONE marks the twenty-fifth anniversary of the passage of legislation to establish the National Park Service. Funds for its work became available in April 1917 just as the United States entered the First World War. Throughout that dark period, continuing on through the intervening years of peace into the economic depression, and now in the shadow of a second war, the Service has continued to hold fast to the ideals of conservation embodied in the basic national parks acts—first, the measure establishing Yellowstone National Park in 1872 “as a public park or pleasuring-ground for the benefit and enjoyment of the people,” and second, the organic act of August 25, 1916, which established the National Park Service “to conserve the scenery and the natural and historic objects and the wildlife” in the national parks, “and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations.”

In these days when conservationists and educators are placing special emphasis on spreading knowledge of all things American, the national parks and monuments take on new significance. Visitors to these possessions of the United States see in them great examples of the works of nature and inspiring scenes of the historic events that laid the foundation for the building of this Nation.

The importance of these holdings in maintaining a national morale was expressed in a resolution adopted in 1940 by the Advisory Board on National Parks, Historic Sites, Buildings and Monuments, stating that "the Service's interpretive program in national park areas, particularly the historic parks and monuments and the great scenic areas, is one of the most valuable contributions by any Federal agency in promoting patriotism, in sustaining morale, and understanding of the fundamental principles of American democracy and inspiring love of country."

To make memorable each visit to a national park, monument, or historic area the story of conservation of natural resources or of historic background is told daily to thousands of American travelers at campfire talks, on nature walks, along the trails on all-day hikes, by the wayside on auto caravans, through museum exhibits and publications, and by other means at the command of this Service.

An informal poll of park visitors conducted by the park rangers, naturalists, historians, and others in direct touch with the visiting public during the past year shows that the national parks are considered by our citizens to play a predominant role in inspiring pride in our American heritage.

Although it is recognized that the most effective contribution the National Park Service can make is to stimulate appreciation of our country with the civilian population, the Service has stood ready to assist the defense program in all other ways within its province. A friendly welcome has been extended to those in the armed forces of our country. Collection of entrance and guide fees has been waived for men visiting the areas in uniform and it has been possible to take many thousands of soldiers through the parks and monuments on scheduled tours.

In accordance with an agreement between the Chief of Staff of the United States Army and the Service, a representative has been assigned to each of the nine Corps Area Headquarters to facilitate any cooperative undertakings related to development of recreational facilities on military reservations, to help select sites for special Army leave centers and their development, to assist in securing additional recreational facilities on nonurban parks for the men in the Army and Navy, and to assist in arranging field trips to national park areas. Many of the men in the military service, particularly the selectees, are the citizens of tomorrow. By organized visits to the scenic areas and historic shrines of our country they gain an enhanced appreciation of America and the resources we guard that will be stimulating to them now and later when they return to civilian life.

To insure proper protection of the essential values of the parks for which it is trustee and at the same time to render all possible active cooperation in defense measures the National Park Service early in

the year established a set of criteria for judging all requests received for uses of park lands, equipment, and personnel during the present national emergency. In accordance with these criteria a wide range of participation in defense activities has been recommended by the Service and approved by the Secretary of the Interior. Representatives of this Service also have collaborated with the War Department in selecting sites for rest camps not located at the Regular Army posts. Enrollees of the Civilian Conservation Corps camps under the supervision of the Service have constructed 16 such rest camps and 16 others are now being planned for in cooperation with the War Department.

Assistance has been given to the Navy Department in the study of soil mechanics and foundation engineering. Maps of the recreational areas of the United States have been prepared for the morale division of the Army. The Service contributed to the engineering defense training program of the Office of Education. Expansion of the physical plant of the Schoodic Naval Radio Station in Acadia National Park was authorized. The Service cooperated with the Army in the selection of 3,052 acres to be eliminated from Hawaii National Park to provide an Army bombing range, and permitted the construction of observation stations on park land there for determining the accuracy of the bombing. In certain national military parks, Army maneuvers were conducted, the requests from the Army indicating that maneuvering over a historic battleground would lend an element of realism to exercises which would be mere routine on familiar maneuver grounds. There were many similar measures of active cooperation in defense activities.

In general, there has been no disposition on the part of defense agencies to exert pressure for the use of national park areas and related properties in any way that would impair or destroy the qualities for which they are being preserved. The relatively few requests for uses adverse to the park concept have been dealt with on their merits as to extent of irreparable damage to park values, urgency to the national welfare, and availability for the same purpose of other lands less important to the future of America.

While the Service is more concerned with quality than with quantity, it is of interest to note that the past year has seen continued growth. On August 25, 1916, when the organic act establishing the National Park Service was approved, the national park system consisted of 16 national parks and 21 national monuments, with a total area of 4,912,794 acres. On June 30, 1941, the Service was charged with the custody of 164 separate units, with a combined area of 21,609,289.63 acres. Its scope now includes not only the national parks and national monuments, but national military parks, national historical parks, national parkways, national recreational areas, the National Capital Parks of the District of Columbia, and other related reservations.



THE BIRTH OF CONSERVATION IN AMERICA

This diorama in the Department of the Interior Museum in Washington depicts Cornelius Hedges, Montana lawyer, presenting his plan of preserving nature's scenic areas for all the people to the members of the Washburn-Langford-Doane expedition at the junction of the Firehole and Gibbon Rivers in Wyoming's famous Yellowstone country on the night of September 19, 1870. This meeting led to the establishment of Yellowstone National Park and the creation of the present system of national parks preserved under the conservation program of the National Park Service and visited by more than 21,000,000 people annually

In 1916, 358,006 people visited the national parks. During the travel year ended September 30, 1940, total visitors to the Federal park areas numbered 16,741,855, and the preseason travel for the current year, both winter and spring, indicated that even that great number will be exceeded.

The Year's Highlights

The Great Smoky Mountains National Park, in North Carolina-Tennessee, was dedicated by President Roosevelt on Labor Day, 1940. The ceremonies were held at Newfound Gap on the State line. The speakers' stand was the lower level of the memorial to the founders of the park which bears a tablet reading: "For the permanent enjoyment of the people this park was given; one-half by the peoples and States of North Carolina and Tennessee and the United States, and one-half in memory of Laura Spelman Rockefeller by the Laura Spelman Rockefeller Memorial, founded by her husband, John D. Rockefeller."

Establishment of a nonprofit distributing corporation, organized under the direction of the Secretary of the Interior, to operate the concession facilities owned by the Federal Government at Mammoth Cave National Park, Ky., marked a new departure in the furnishing of accommodations to national park visitors. The operation of concession facilities by this corporation is based on the belief that the Government should own and control, wherever possible, the physical developments for accommodation of the public in national park areas, to provide simple and adequate facilities at reasonable rates.

Ratification by the Senate of the Inter-American Convention on Nature Protection and Wildlife Preservation was an important step in national park conservation. The treaty calls for establishment and extension of national parks, nature areas, and similar reservations which will preserve natural wonders, exceptional scenery, or places of outstanding historic or scientific interest. It should lead to close, effective cooperation between park officials in the creation and preservation of a system of inter-American parks representative of the finest natural characteristics of the Western Hemisphere. It should also lead to an increase in inter-American use of the parks of all the countries concerned. The treaty's specific provisions for the protection of wildlife in national parks also are significant.

Excellent progress continued on the Blue Ridge Parkway. Over 320 miles of scenic roadway were reported completed or under construction during the 1941 fiscal year. The 140-mile continuous paved unit between Adney Gap, Va., and Deep Gap, N. C., carried 750,000 visitors during the travel year. Other graded sections totaling 86 miles were open on a "drive at your own risk" basis.

The Natchez Trace Parkway passed the three-figure mark for the first time, reporting 106 miles completed or under construction in Mississippi and Tennessee. The first Alabama contract was advertised for bids late in the year.

A study of the recreational resources of the Tennessee and Cumberland River watersheds, and the surrounding area affected by them, was undertaken by the Service in collaboration with the officials of the eight central Southeastern States and other Federal agencies. From the results of the study, when available, it is expected that a coordinated recreational program may be effected. A similar study was planned for New England.

Congress enacted legislation for the establishment of the United States Travel Bureau as a unit of the National Park Service. No direct appropriation was available for the 1941 fiscal year, activities being financed through emergency funds, but the Bureau will be financed with regular funds from July 1, 1941, through June 30, 1942.

Dr. Hermon C. Bumpus, chairman of the Advisory Board on National Parks, Historic Sites, Buildings, and Monuments, resigned

from the Board because of ill health. The vacancy thus created was filled by the appointment of Dr. Thomas Barbour, Director of the Harvard University Museum and of its Museum of Comparative Zoology. Another vacancy on the Board, caused by the death of Maj. Gist Blair of Washington, D. C., was filled by the appointment of General Superintendent Charles G. Sauers of the Forest Preserve District of Cook County, Ill.

The proposed Big Bend National Park in Texas approached realization, following an appropriation of \$1,500,000 by the State legislature for the purchase of privately owned land within the park project. (Governor O'Daniel signed the appropriation bill in July 1941.)

In New Mexico, the State legislature provided for creation of the Conchas Dam State Recreational Area by enacting legislation for the acceptance of a War Department recreational easement deed to 640 acres of federally owned land fronting on the 16,000-acre Conchas Lake near Tucumcari. Facilities for swimming, boating, and camping are being developed by the CCC.

The United States Senate passed and sent to the House a bill providing for establishment of the Coronado International Memorial on the United States-Mexico boundary near Naco, Ariz. The legislation makes the memorial's establishment contingent upon a similar area being set aside by the Republic of Mexico, each area to be administered by the respective governments.

The Service has assisted the Bureau of Reclamation, the War Department, and various State agencies in making investigations, surveys, studies, plans and reports concerning the potential recreational values of several reservoir areas. The most important of these, perhaps, is the Columbia River Reservoir above the Coulee Dam, where, at the request of the Bureau of Reclamation, this Service is making a land use plan. Some of the reservoirs where preliminary investigations have been made include reservoirs resulting from the Shasta and Friant Dams, California, now under construction by the Bureau of Reclamation, and the Hansen, Sepulveda, and Santa Fe Dams now under construction by the War Department.

Another interdepartmental activity was the Service's cooperation with the Bureau of Prisons in landscape architecture projects at Alcatraz Penitentiary in San Francisco Bay.

In the historic field the year has been notable for important additions to the Federal park system. The Vanderbilt Mansion, Hyde Park, N. Y., home of the late Frederick W. Vanderbilt, a magnificent example of the palatial residence of the late nineteenth century, was given to the United States by Mrs. Margaret Louise Van Alen, niece of Mr. Vanderbilt, and designated a national historic site.

Full advantage has been taken of the potentialities of the cooperative agreement, a form of contract authorized by the Historic Sites

Act, whereby the Secretary of the Interior or local groups or individuals agree to protect, preserve, maintain, or operate a historic site, structure, or object, regardless as to whether title thereto is vested in the United States. An agreement was made with the Association for the Preservation of Virginia Antiquities by which that group and the Service are cooperating in historical and archeological studies in all museum work on their respective portions of Jamestown Island, Va., scene of the first permanent English settlement in America.

A cooperative agreement has likewise been made with the Roanoke Island Historical Association. By the terms of this agreement, Fort Raleigh, a 16.45-acre park on Roanoke Island, N. C., has become Federal property. The Roanoke Island Historical Association will continue to present in the waterside theater Paul Green's celebrated pageant-drama dealing with Sir Walter Raleigh's "Lost Colony." A stipulated portion of the income from this production is to be used to purchase additional acreage for the national historic site, or for archeological and development work.

As a result of a cooperative agreement with the State of Texas and the Archbishop of San Antonio, trustees for the Catholic Church, the United States has designated as a national historic site San José Mission, near San Antonio, regarded as one of the finest missions of the Spanish period of the Southwest. It will be preserved as a place of worship and will be used for inspiration and benefit of the people.

The McLoughlin Home, Oregon City, Oreg., residence of Dr. John McLoughlin, head factor of the Hudson's Bay Co. in the Oregon country and distinguished leader in the settlement of this region, was designated a national historic site following the consummation of a cooperative agreement with the McLoughlin Memorial Association and the municipality of Oregon City.

Winter use of national parks, particularly in the West, has materially increased, especially at Mount Rainier and Yosemite National Parks. At Mount Rainier, 136,220 persons entered the park during the ski season from December 1, 1940, through April 30, 1941, representing an increase of 27 percent over the previous year's record.

The Service's policy on winter activities received much favorable comment during the season. Ski touring is becoming a popular and desirable phase of winter activities in the national parks.

At Yosemite, the Ostrander Lake ski hut was put into use, and the parking area at Badger Pass was enlarged. At Lassen Volcanic, winter conditions were exceptionally favorable, and winter activities are expected to continue into July. A midsummer ski tournament was held there in June.

One hundred organized camps on 46 recreational demonstration areas were in use throughout the summer of 1940 and approximately 1,000 organizations made use of the facilities for week-end and holiday

camping throughout the year. Because of their proximity to military and industrial defense concentrations, these areas are being used extensively by soldiers, sailors, and industrial workers.

An average of 304 CCC camps were operated on 2 military areas, 90 national parks and monuments, 22 recreational demonstration areas, and 190 State, county, and metropolitan parks. During the last quarter, 8 camps were operating exclusively on military areas, and 8 camps furnished details ranging from 25 enrollees to full companies for temporary assignment to similar areas. In addition, 12 camps furnished 25 to 80 enrollees a day for periods of 6 to 8 weeks to develop 13 Army recreation centers or rest camps near metropolitan centers in 10 States and the District of Columbia. As a further aid to national defense, 5 airports in 5 States were constructed, enlarged, or improved by CCC forces. Camps were terminated on 30 areas where development had reached a stage sufficient to meet the essential requirements of the public, and camps were established on 13 new areas. Nine territorial CCC units were operated in [Hawaii and] the [Virgin Islands].

At the request of the War Department, the services of a land purchaser of the National Park Service were made available for the purpose of appraising certain properties being acquired for addition to Fort Knox, Ky.

During the year the Service was elected to membership on the Highway Research Board of the National Research Council, a national clearing house for highway research activities and information. The Chief of Engineering was appointed to represent the Service on the Board.

Notable among the road work under construction during the year was the Crystal Cave Road at Sequoia National Park, Calif., a grading job through rugged country; the No Thoroughfare Canyon Road at Colorado National Monument, Colo., another grading job through extremely rugged country that entails a great amount of rock excavation plus one road tunnel, 535 feet long, through solid rock; the Yazoo City Road at Vicksburg National Military Park, Miss., and the Highway By-pass Road at Appomattox Courthouse National Historical Monument.

Field studies have been accomplished in many of the parks covering public utility services, which include rate investigations and recommendations of rate schedules, engineering analysis and recommendations and preparation of public utility service operating agreements in cooperation with the Office of the Chief Counsel.

The use of radio in the park areas has become well nigh indispensable in administration and protection work. Nineteen national parks, 15 national monuments, the Blue Ridge Parkway, and Boulder Dam National Recreational Area now have two-way radio communication.

facilities representing an aggregate investment of approximately \$75,000. Most of these sets are of Park Service design. Notable among the radio communication systems installed during the past year is the one for the Blue Ridge Parkway, completed in February 1941. It embodies the latest in design of modern radio equipment, utilizes a Park Service top-loaded antennae design and affords two-way communication from ranger patrol cars to other patrol cars, district headquarters or to the parkway headquarters at Roanoke, Va.

Scientific research conducted by the staff of the Branch of Interpretation, technicians, collaborating scientists, and the section on National Park Wildlife of the Fish and Wildlife Service, produced basic data essential to the conservation, development, and interpretation of scenic and scientific values in National Park Service areas. The increasing number of undergraduate and graduate college and university classes utilizing the national parks and monuments in pursuit of scientific knowledge is strong testimony of the superlative values being conserved within the areas. The increasing number of park visitors attending illustrated lectures, participating in guide trips, and making use of museum facilities provided by the naturalist staff and museum technicians also is evidence that the visiting public is responding to the Service's efforts to provide opportunities for the use of the national park areas.

The Park, Parkway, and Recreational-Area Study

The Service has continued the park, parkway, and recreational-area study in cooperation with other Federal, State, and local agencies. During the year State-wide reports for park and recreational programs have been prepared in Arizona, Delaware, Maryland, and North Carolina—making a total of 34 such reports completed.

In cooperation with Federal and State agencies, regional recreational studies have been initiated in New England and in the central-southeastern region which comprises the Tennessee and Cumberland watersheds and the surrounding area affected by them. During the development of individual State plans, it became evident that certain problems could not be met adequately within the limits of State boundaries. Each State plan has to consider existing and proposed facilities in adjoining States within reasonable distance of its borders, as well as nearby residents in adjacent States who may visit its parks and recreational areas. Consideration also has to be given to outstanding recreational resources such as mountain areas and bodies of water that are of more than State significance. It is expected that regional studies will enable State and Federal agencies to adjust their individual programs to effect proper coordination.

The 5-year survey of municipal and county parks in the United States is now under way cooperatively with the National Recreation Association and the American Institute of Park Executives.

The information being assembled and techniques being developed through the recreation study are becoming increasingly important. Its material has been utilized effectively in assisting the War Department to plan and develop rest camps and recreational facilities; in helping the Office of the Federal Coordinator for Health, Welfare, Education, Nutrition, Recreation, and Related Activities to plan for recreational facilities and programs near Army cantonments and industrial defense centers; in cooperating with the Bureau of Reclamation and the Corps of Engineers in planning recreational developments in connection with water-control projects; and in collaborating with the National Resources Planning Board in planning a program of public works and land use adjustments.

State Relationships

The cooperative relationship with State, county, and metropolitan park authorities, which began in 1933 with establishment of the Civilian Conservation Corps, remains one of the noteworthy features of operation of CCC camps, as well as of conduct of the park, parkway, and recreational-area study. While the Service recognizes its primary responsibility for economical and effective use of Federal funds in conduct of CCC work, there is constant and conscientious effort to understand the viewpoint of the agencies on whose areas the work is being performed, to recognize it within the limits of that responsibility, and to assist in strengthening their administrative and technical staffs and building up their prestige. The more restricted Federal funds available during recent years has compelled non-Federal agencies to supply an increasing proportion of their own funds in order to permit the cooperative planning and conduct of sound work programs, and has increased the sense of joint participation and responsibility among those agencies.

One of the real contributions to recreational programming and progress in cooperation with the States has resulted from Service suggestions for sound, periodically revised master plans and related work programs. Particular attention has been given to master planning and programming of the recreational demonstration areas, many of which probably will be transferred ultimately to State or local agencies.

The Service continues to receive requests, and to meet them so far as possible, for information on all phases of park selection, development, and use and for assistance in perfecting park and recreation legislation.

Although understaffed for the purpose, the Service, under a cooperative agreement with the Work Projects Administration, analyzed and made recommendations on about 300 WPA applications involving approximately \$75,000,000 worth of recreational improvements to State and local areas throughout the country.

Use and Development of Historic Areas

With the view of expanding the interpretive program of the historic areas to place more stress on an understanding of the fundamental principles of democracy, the interpretive programs of the major historic and archeologic areas were reexamined, and recommendations were made for further improvements. More emphasis also was placed by ranger-historians on the part played by the various historic areas in the American way of life.

Saratoga Battlefield National Historical Park in New York, turning point of the American Revolution, is undergoing development through the use of CCC funds and labor. Work in this newly acquired area includes archeological and historical studies preparatory to a development program similar to that at Yorktown, Va., where sites of the old fortifications have been located by archeological methods, restored sample sections of the military earthworks, and carried on a broad program of development and interpretation. In the Jamestown portion of Colonial National Historical Park, historical and archeological studies continue to shed a wealth of light on the social, political, economic, and religious life of the Jamestown settlers. At Hopewell Village National Historic Site, Pa., ERA workers and CCC camps were engaged in preserving and partially restoring the area, which is one of the significant iron-making centers of the Revolutionary period.

The Service has instituted a folk culture or artcraft program to make the historical exhibits live again. Particular attention has been given to this program in Great Smoky Mountains National Park, where the 7 CCC camps have restored mountaineer cabins and structures and collected folk museum materials. Although the original mountaineer population has been largely removed from the park, many mountaineers still live in its vicinity, and the problem is not that of importing strangers to carry on folk arts, but one of persuading the artisans and handicraft workers already in the vicinity to continue their old techniques and to preserve their distinctive culture. This problem must be solved quickly because each year there is a constantly increasing loss of folk culture values. The study of phonographic recordings of mountain speech was continued through cooperation with Columbia University, with the aid of equipment purchased by the Service. Conservation of folk culture values in

Shenandoah National Park, Va., also has been studied. At the Whitman National Monument, Wash., a WPA project has been set up to engage in archeological and development work.

At Kings Mountain National Military Park, S. C., a \$40,000 museum and administration building has been erected with regularly appropriated funds. Similarly, a \$30,000 administration and museum building is being erected with regular funds in Manassas National Battlefield Park, Va.

For the reconstruction of the McLean or Surrender House, and for the historical and archeological work at Appomattox Courthouse National Historical Monument, \$92,000 of regular funds are being expended. There also is a CCC camp in the area engaged in archeological and other work preparatory to reconstruction, restoration, and interpretation of this key site commemorating the end of the American Civil War and the reestablishment of national unity.

Historic "Old Bedlam" and other buildings at Fort Laramie National Monument, Wyo., are being repaired and restored through ERA and a small regular appropriation.

The \$10,000 appropriated for the Atlanta Campaign Markers is in part being used as a sponsor's contribution for a WPA historical project, designed to make an effective development of the five authorized national historic sites commemorating this celebrated campaign.

At Ocmulgee National Monument, Ga., the Service has accomplished all of its development, archeological, and museum work through ERA and CCC. As the logical center for Park Service archeological studies in the Southeast, only regular funds for the completion of the museums and for curatorial experts are needed to make this monument the vital energizing factor in Southeastern archeology that it ought to be.

One of the most interesting of the historical projects in the vicinity of Washington, D. C., is the restoration and development of the Chesapeake & Ohio Canal. This historic old canal which served to link Georgetown with Cumberland, Md., is being restored and developed with CCC funds and labor.

Interpretive Service and Scientific Research

The year has witnessed a critical review and reexamination of the programs of public agencies engaged in educational activities contributing to national understanding of American values and democratic principles. National Park Service programs stand out among the activities directed toward attainment of citizen appreciation of our national heritage; they constitute one of the potent forces effecting mental preparedness and maintaining national morale.

Thirty-four permanent naturalists and 114 temporary ranger-naturalists reached 5,835,577 visitors in 41 National Park Service areas. Small staffs of geologists, biologists, and museum experts extended technical assistance and guidance to the naturalists in the conduct of their research and interpretive programs.

Radio found increased use in interpretive programs during 1940-41. Groups from cantonments of the United States Army were given special attention in park areas. Several parks offered programs of special interest to children. Over 100 college and university classes entered the parks and monuments for scientific study, receiving the personal services of the naturalists and access to study collections. Many naturalists and other park officials participated in community activities adjacent to parks.

Of special significance among naturalist activities was the initiation of plans for producing for each scenic-scientific area an interpretive sheet for the master plan series, the sheets to include an interpretive statement and interpretive plan.

Public Response to Interpretive Services

During the year the Director received over 10,000 letters commenting favorably on naturalist service in National Park Service areas. The letters emphasize the importance of the naturalist program in sustaining morale, inspiring love of country, and telling the story of the national parks and monuments.

Research

The interpretive program was based on scientific research conducted by the personnel of the naturalist division, other technicians of the Service, collaborators, and cooperating research institutions. The preservation of the natural conditions in park areas makes them reservoirs of source material attracting many research scientists. During the year, 97 scientific research groups visited the parks. These groups received the active cooperation and in some instances close collaboration of the interpretive staff. Many new facts were added to the store of knowledge.

In addition to the contributions by private research agencies, the accumulation by Service technicians of a great mass of periodic observations continued. These deal with habits of plants and animals and their reaction to environment, records of rainfall, snowfall, and atmospheric conditions, the action of glaciers, erosion, thermal activity, and distribution of rocks and minerals.

Accomplishments of Geologists

The question of mineral values in park areas is raised frequently in connection with the defense effort and in the acquisition of new areas. In the appraisal of these values to the end that park resources may be most effectively used or that an equitable settlement may be made, the geologists take an active part. They also have contributed notably to the development of water supplies. Of note is the aid given to military preparations in the West Indies and to Government-sponsored rehabilitation work in St. Croix, Virgin Islands. A water-well drilling program was devised and is being successfully carried out to meet the needs in two of the Army's developed areas and to furnish water for homestead, public service, and limited industrial use on St. Croix.

Museums

Through more than 115 museums in active use the Service provided visual assistance in understanding park areas. Further evidence of the valuable role museums have assumed in National Park Service interpretive work is the fact that museum facilities continued to be improved and expanded. Thus, 3 new museum buildings were erected and a fourth remodeled this year; permanent exhibits were installed in the Kings Mountain National Military Park museum and were far advanced for the completely revised Loomis Memorial Museum in Lassen Volcanic National Park; a full set of temporary exhibits was placed on view in the new Ochs Memorial Observation Station at Chattanooga; and additions or revisions were made in the existing displays of at least 20 more park areas. Active growth also is indicated by the preparation of the intricate plans necessary for museum development. During the year 3 museum prospectuses were approved and 7 exhibit plans were completed. These plans include 4 that were unusually extensive.

At the Eastern Museum Laboratories work continued to center on museum development for the Jefferson National Expansion Memorial, Mo. The laboratories also produced the exhibits for Kings Mountain and the Ochs Memorial, two important additions to the system of park museums.

The Western Museum Laboratories had as their principal projects the construction of exhibits for the Loomis Memorial Museum and development of detailed plans for the new Painted Desert Museum in Petrified Forest National Monument.

A milestone in the progress of park museum work was publication of the National Park Service Field Manual for Museums. This 400-page book by the Chief of the Museum Division promises to be very influential in raising the standards of museum operation throughout the Service.

Exhibits were circulated to five fairs and conventions, and on the other hand, the National Park Service received considerable equipment and many specimens from the French Pavilion of the New York World's Fair as a gift of the French commissioners.

Wildlife Studies

Wildlife research was carried on by park naturalists, park rangers, and by the section on National Park Wildlife, Fish and Wildlife Service.

The principal research project that it has been possible to undertake this year has been the practical completion of field work in the study of the predator-Dall sheep relationship in Mount McKinley National Park, Alaska. The mountain sheep or bighorn of the United States proper has also been given much attention in a number of park areas. Studies of dietary and mineral requirements of the species in Rocky Mountain National Park, Colo., were continued; migration and range are being studied in Yellowstone National Park by the naturalist staff; the regional biologist and park staff are studying the effects of pasturing horses on the lambing range in Glacier National Park. Studies of the Nelson bighorn in Death Valley National Monument, Calif., indicate a more favorable condition than has been apparent for a number of years.

Other inventories consisted of deer population studies at Acadia and bird studies in Olympic and Hawaii National Parks. Wildlife studies were made in Joshua Tree and at Organ Pipe Cactus National Monuments, and at a number of the southwestern national monuments. Investigation of forage utilization by deer, elk, and beaver in Rocky Mountain National Park was continued. Additional wildlife studies were made on recreational demonstration areas in New York, Pennsylvania, and along the Blue Ridge Parkway.

Wildlife Management

Reduction in numbers of the larger herbivorous animals and domestic stock using the ranges in the parks has been a major project in Service management during the past year.

Reduction of the bison herd of Yellowstone National Park by 200 animals was accomplished mainly by disposal to Indians. At Wind Cave National Park, S. Dak., the bison herd was reduced by the shipment of 7 animals to various State parks and to private herds.

Reduction of the Yellowstone elk herd was practically negligible this year due to mild weather conditions which allowed the elk to remain in the higher country throughout most of the year. Balancing this disruption of the management program, however, is the fact

that the overgrazed "winter range" was used very little during the winters of 1939-40 and 1940-41.

Elk reduction was carried on at Rocky Mountain and Olympic National Parks through special hunting regulations on areas adjacent to the parks. The reduction at Olympic this year did not reach that of last year due to decreased numbers of animals and added protection due to newly acquired park lands. From Rocky Mountain it was reported that 50 animals were killed during the special season on lands adjacent to the park. Plans are being made for further study of the deer and elk problem through cooperation with the Pittman-Robertson staff and the Colorado Game and Fish Commission.

The reduction of deer population on the Hickory Run and Blue Knob Recreational Demonstration Areas, Pa., was accomplished by special hunting regulations.

The continuing range study in Yellowstone National Park indicates that the range is recovering and making satisfactory progress toward restoration; however, it has not yet reached normal carrying capacity, and further reduction of animals using it will be necessary before it can recover completely from overuse by elk, bison, and antelopes.

The bear-visitor problem has become less acute as a result of good acceptance of increased educational work to acquaint the visiting public with the dangers of promiscuous feeding. The publication of literature on feeding the bears has helped to decrease the number of accidents due to this form of entertainment, and the park rangers have been vigilant in trapping and moving dangerous bears before they get out of control.

Reduction of Grazing by Domestic Stock

Through cooperative agreements between the National Park Service and the Grazing Service, grazing on areas such as Carlsbad Caverns National Park and Grand Canyon and Dinosaur National Monuments has been handled on a basis of gradual reduction of animals, with the objective of eventual elimination. In areas bordering on national forests, such as at Bryce Canyon and Kings Canyon National Parks, the work is being handled on a "tapering off" process, looking toward eventually eliminating grazing on the areas.

Removal of saddle horses from the bighorn lambing grounds in Glacier National Park is expected to result in improved range conditions in the area and better health of the wildlife concerned.

Range conditions in Death Valley National Monument have been greatly improved by reduction of the wild burro population on the area. At White Sands National Monument, N. Mex., antelopes have been stocked through cooperation of local organizations, and the range is being improved by restoration of water holes for use by these animals.

Fish Conservation

This work was carried on principally by the Division of Fish Culture and Fishery Biology, Fish and Wildlife Service, in cooperation with that Service's section on National Park Wildlife.

Heavy plantings of fish were made in accordance with scientific planning to keep the national park fishing conditions at a high standard. A noteworthy study was conducted by the naturalist staff of Crater Lake National Park upon which will be based the fish planting program for Crater Lake. Cooperative agreements were drawn up between the National Park Service, the Fish and Wildlife Service, and the State of California on fish planting procedure. Agreements were also drawn up between individual parks and the California State Game and Fish Division relative to fish planting programs in the national parks of that State.

Accommodations Furnished by Park Operators

During the period of selective service training, trainees or members of the military and naval forces of the United States while in uniform and visiting a Service area were offered reduced rates for accommodations by the concessioners in most of the larger areas.

The employment of aliens in national park areas has been prohibited during the national emergency.

National Park Concessions, Inc., a non-profit-distributing membership corporation authorized by the Secretary of the Interior to operate the concessions at Mammoth Cave National Park, Ky., began operating the public facilities in that area on June 21, 1941.

The corporation's purpose is to furnish adequate accommodations for the public at reasonable rates and to develop these facilities solely in the interest of the public welfare. Profits will be applied to furthering the development of concession facilities in the Mammoth Cave National Park. Since it is strictly a membership corporation, it can issue no capital stock and is not to be conducted for the profit of the incorporators.

The operations which are thus being continued under the National Park Concessions, Inc., have continued uninterruptedly from 1816 when the Mammoth Cave was first opened to visitors. It was strictly a private business venture from its beginning until 1929. For 90 years, from 1839 to 1929, it was operated by Dr. John Croghan, or by a trusteeship under the provisions of his will. Between 1929 and June 21, 1941, when the new corporation was organized and took over the operations, all public facilities were operated under various arrangements, either individually or by joint management, by the Mammoth Cave National Park Association and the Kentucky National Park Commission.

To insure that all public service facilities in the park would continue in a satisfactory manner, the three ranking executives, then in direct charge of the operations, were invited to constitute a majority of the corporation's board of directors and its principal officers. They are W. W. Thompson, as president, who had been identified with the park movement for 13 years as secretary to the Mammoth Cave National Park Association and the Kentucky National Park Commission; and H. S. Sanborn and Mrs. Beulah Brown Sanborn, as treasurer and secretary, respectively, who had been in national park concession work for more than 20 years and in charge of the Mammoth Cave Hotel since 1936. A. J. Knox, attorney of the Chief Counsel's office of the Service, and Charles L. Gable, Chief, Park Operators Division, Branch of Operations, completed the directorate of five.

Title to all of the property leased to this corporation and concession operation remains in the name of the Federal Government. The corporation may build and own additional facilities and properties necessary for public service and may contract for loans to facilitate such developments. If at any time, however, it should cease operations, all properties or the profits from the sale of such properties would be turned over to the Federal Government. The relationship of the National Park Service to the corporation is identically the same as that maintained with the other private operators in the various national parks and monuments and includes such things as supervision over hours and wages of employees, prices of food and other services, sanitation, and other matters in the interest of public welfare.

The National Park Service Conference held in Washington from January 21 to 29, 1941, continued the studies begun at the 1939 Santa Fe Conference with respect to matters arising from the operation by private concessioners of hotel and lodge accommodations, bus transportation, stores, and other public facilities. Specific recommendations were made by the conference and are now under consideration by the Service on size of buses, bus rates, medical associations, uniform method of establishing rates, additional personnel for Park Operators Division, Branch of Operations, yardstick rates, tent accommodations, and coordination of demands on park operators for additional investments.

The Crater Lake National Park Co., after approval of plans for the installation of additional and improved housing facilities in Crater Lake National Park, was granted a new 20-year contract extending from June 1, 1941.

Anna K. Pryor and Elizabeth Trischman, coffee shop and lunchroom operators in Yellowstone National Park, were given a new long-term contract in lieu of their present one following the consummation of arrangements under which their coffee shop and 'general store' buildings in Mammoth Hot Springs area were to be demolished and new

facilities constructed at a location deemed by the Service to be more appropriate in the public interest.

Miss Mary Ellen Degnan and John Degnan, pioneers in the operation of a bakery and lunchroom service in the old village in Yosemite National Park under a succession of yearly informal permits, have been issued a long-term contract in view of the arrangement between them and the Service to discontinue their present operations and move to a site in the new village.

Aaron Hill, the concession operator in the Statue of Liberty National Monument in New York Harbor, having removed from the old concession space in the Statue and established himself in the new and more commodious concession building constructed by the Government outside the monument, was granted a long-term contract in lieu of a former yearly arrangement under an informal permit.

Effective January 1, 1941, under a special concession contract, the Welfare and Recreational Association of Public Buildings and Grounds, Inc., began the operation of housing, lunchroom, and related facilities in the Fort Washington area in Maryland under the National Capital Parks. That association also entered into a formal contract with the Department of the Interior for the construction and operation of new tennis courts and other facilities in East Potomac Park of the National Capital Parks System, as well as the operation of the Government-owned tennis courts elsewhere under the National Capital Parks System.

The Glacier Park Hotel Co. completed the installation of the new East Glacier Lodge and Cabin lay-out at Roe's Creek in Glacier National Park.

C. H. Montgomery commenced operations on January 1, 1941, in the new Government-owned joint concession and Government headquarters building at Muir Woods National Monument under a 5-year contract.

Standard Concessions, Inc., commenced operations on July 1, 1940, of the new Painted Desert Inn at Petrified Forest National Monument.

Conversion of the old type cabins into new and improved housing units, together with their relocation under the new master plan arrangement continued according to the approved program at the various areas in Yellowstone National Park.

Final approval was given to the plans and construction commenced on an 18-room lodge unit at the Boulder Dam National Recreational Area, and it is expected that these facilities will be ready for occupancy before the close of the calendar year.

Plans were approved for the remodeling to include private baths in a considerable number of the present nonbath standard cabins of the Utah Parks Co. on the North Rim of the Grand Canyon National Park and in Zion National Park as the beginning of a comprehensive

program under which there will be available a satisfactory number of bath cabins at popular prices in the national parks served by that company, which is a subsidiary of the Union Pacific System.

Approval was given to add bathrooms to 10 cabins operated by the Yosemite Park & Curry Co. in the Camp Curry section at Yosemite National Park, and the Service and the company reached a tentative agreement on a major plan for the installation of improved facilities in the Yosemite Lodge area in that park.

After the solicitation of bids, a contract was awarded to and operations commenced effective January 1, 1941, by the Seven-Up Bottling Co. of Richmond, Va., of the bathhouse refectory and refreshment services in the Government-owned facilities at the Swift Creek Recreational Demonstration Area in Chesterfield County, Va.

Bids were solicited, under the National Historic Sites Act, for the furnishing of concession facilities to the public in the Government-owned pavilion and on the rear lawn in the Vanderbilt Mansion National Historic Site at Hyde Park, N. Y. The contract was awarded to Miss Constance Ekstrand, the only bidder, and it is expected that the facilities will be ready for operation about October 1, 1941.

Rate studies were conducted, to a limited extent by reason of limited personnel, both in Washington and in the field, and new reductions in the rates for various facilities were made effective. Special field studies are to be made during the summer at Yosemite, Sequoia, and Lassen Volcanic National Parks. Because of the rapidly rising price of food commodities and increasing labor costs, considerable attention was given to meal and grocery prices to verify that such increases as were being made in miscellaneous items were based only on a satisfactory justification of increased costs.

Information Service

A world-wide audience was kept informed on the National Park Service, its fundamental principles and activities, through the media of radio, educational extension projects, printed and processed literature, press, picture service, and illustrated lectures.

Recognizing the ever-broadening channels of communication represented by radio and pictorial services, the output of radio scripts was increased and a newspaper mat service introduced. Attuned to the need of the hour for renewed dedication to the spirit of democracy, historical literature has been greatly improved and is carrying more interpretive material than ever. Accounts of historic sites and battlefield areas are lucid and vivid, interpreting their significance in the light of the present world crisis. More than three times as many pieces of historical literature have been issued for distribution this

year than last (2,900,000 *in toto*). Four booklets in the popular studies series have been highly rated by educators.

A total of 8,448,350 publications was issued, of which 7,494,750 were printed (121 being new and 37 revised); and 953,600 multilithed (20 new and 21 revised). Again the method of field printing, inaugurated last year, has justified the change, in savings both of time and money.

Radio

The major radio work of the Service during the year was completion of a new series of 13 fifteen-minute scripts on park wildlife, dramatized for children in unique manner; and preparation of 6 conservation scripts, covering geology, history, archeology, wildlife, forestry, and "the national park idea," from which records will be made for use in elementary schools.

Other radio work of the year included preparation of several national park scripts for production over the Department's "Conservation Reporter" hour on Mutual's coast-to-coast network; and a script for the General Federation of Women's Clubs, Vacations With Uncle Sam, also broadcast over Mutual.

Requests continued to be received for the Office's 1938-39-40 series—America's Hours of Destiny and Two on a Trip. Eight new scripts were added to the original 13 in the Two on a Trip series, at the request of WNYC, New York, for broadcasting during July, August, and September 1940.

In the field, the Service's popular Nature Sketches, broadcast for the fourth consecutive year over NBC from Rocky Mountain National Park, was offered to a larger audience through extension of outlets. Numerous individual broadcasts were reported from many parks and monuments, including initiation of a series of weekly programs concerning Boulder Dam National Recreational Area, over Station KENO, Las Vegas, Nev., and a special cooperative radio project between Mount McKinley National Park, Alaska, and Station KFAR in Fairbanks. The latter included two short-wave broadcasts from the park to the station, which rebroadcast them, and another program recorded by the station for national distribution to publicize the park.

Lectures

Free illustrated lectures conducted midweekly from October to May in the Departmental Auditorium, Washington, D. C., continued to mount in popular appeal. Capacity audiences, with hundreds frequently turned away, again were the rule. Fourteen such lectures brought an attendance of 22,450 persons. Both travel and the popular sciences, as demonstrated in national park areas, were featured.

Historical lectures stressed the contributions made to North American culture by the Spanish padres and early colonizers of Florida.

Compendiums of Information

Information requests were met, as in former years, from publishers of encyclopedias, almanacs, and scientific and historical textbooks. These were filled by the technicians of the Service who also revised and brought up to date texts and illustrations in various annuals and almanacs of cognate nature.

A chronology of Memorable Dates East of the Mississippi 1519 to 1836 was compiled.

Cooperation in Southwest's Spanish-American Anniversary

The year 1940 marked the four hundredth anniversary of one of the outstanding dates in American history—the first extensive exploration of the Southwestern United States in 1540 by white men. This event was commemorated by the Coronado Cuarto-Centennial.

National significance of this celebration, coupled with the fact that more than a score of national monuments are preserved in the Southwest, led the Service to participate through educational-extension projects focused in a 2-year program, beginning in 1939. This program was designed to familiarize all sections of the country with the salient facts of Southwestern history and to promote sympathetic understanding between the United States and her American neighbors south of the border.

Historians and archeologists of the Service prepared all except two of the monthly articles, with bibliographies, in the 1939 series entitled, "Our Own Spanish-American Citizens and the Southwest Which They Colonized."

Besides a mailing list for this 2-year series, which includes State directors of education, universities, and colleges throughout the United States, all English-speaking countries were covered through at least three known channels.

United States Travel Bureau

The United States Travel Bureau was placed on a permanent basis by legislation signed by the President on July 19, 1940, and was continued in operation through the appropriation of \$75,000, as authorized by the Congress, for the fiscal year ending June 30, 1942. This regular appropriation was fortuitous as it enabled the Bureau to lend its support and services to the national defense program, particularly to that phase concerned with national morale, recreation, health and welfare.

Reports received during the current travel season indicate that the Nation's annual travel expenditures will exceed the 1940 figure of \$6,000,000,000. If the volume continues at the present pace, the resultant expenditures should reach \$7,000,000,000. This will mean a tax return to the United States Treasury of about \$700,000,000.

Although the Bureau has enjoyed the support of the main segments of the travel industry since its inception, that attitude has now developed to the point where all groups in the travel field have translated their endorsement into aggressive support of the Bureau's Travel America program.

To keep the Bureau in close contact with the traveling public and the private travel industry, the agency maintains branch offices in New York and San Francisco. As an illustration of the volume of assistance rendered to the traveling public, the Bureau furnished travel information without charge to more than 1,000,000 persons and organizations during the year.

The Bureau's informational services include the periodic distribution of the *Official Bulletin*, the *Calendar of Events*, *Eastern Travel Today*, and *Travel West*. The *Official Bulletin* goes to all organizations in the United States and many foreign countries which are actively interested in trends and developments in the field of travel promotion. The *Calendar of Events* fills a long-felt need by providing a national list of outstanding coming events and happenings that attract travel. *Eastern Travel Today* and *Travel West*, published by the branch offices, fulfill an important function by keeping the traveling public and the travel industry currently informed of the maintenance of services and facilities which are provided by the individual resorts and tourist centers throughout the country.

The Bureau continued during the past fiscal year to render aid to the President's "Good Neighbor" policy through the medium of travel. This cooperation is being manifested in a number of ways under the American Republics program, which includes the translation and rescoring in Spanish and Portuguese of outstanding Government motion pictures to be distributed free in the other American Republics. These films will reach a large cross-section of the populations of those countries, and it is confidently expected that they will engender increased understanding of the United States and closer hemispheric friendliness.

The Bureau also has worked closely with the Pan-American Union and with American interests in the other American republics.

In its program in the interest of travel promotion the Bureau has made effective use of radio, motion pictures, exhibits, lectures, and other promotional media. These activities included participation in the Golden Gate International Exposition, the New York World's Fair, *The Chicago Daily News* Travel Exposition, *The Detroit News*

Travel Show, and other important travel exhibitions. A comprehensive travel bibliography is nearing the publication stage.

Through the cooperation of the travel industry, a Travel America Hall has been established in the New York branch office and has collected outstanding exhibits and promotional material dealing with travel attractions in all sections of the United States. The Western branch office has been moved from inadequate quarters to appropriate space in the Old Mint Building at San Francisco. The new quarters will enable that office to provide more adequate facilities for giving information to the traveling public. A major program being carried out through the Western States Promotion Council with the endorsement of the Bureau and the active support of the Western branch office is the "See the Old West" campaign. This program already is meeting with success, and has enlisted the cooperation of the governors and travel organizations in the 11 Western States.

The press and radio have been generous in their consistent support of the Bureau's current travel promotion program, which centers about the theme: Travel Strengthens America. It Builds the Nation's Health, Wealth, and Unity.

Historic Sites Survey

The Nation-wide historic sites survey is proceeding according to a chronological thematic program. Preliminary reports on seventeenth century English sites and on frontier sites of the periods 1763-1830 and 1830-1900 have been completed, and work has been begun on eighteenth century English sites and on American Revolutionary sites. Under each thematic group all important sites are inventoried, and the most significant are investigated. A summary report with recommendations is then prepared for consideration by the Advisory Board on National Parks, Historic Sites, Buildings, and Monuments.

In connection with the Archeological Sites Survey, the Middle Mississippi Valley Archeological Survey, comprising sections of eastern Arkansas and western Mississippi, under collaboration with Harvard University, the University of Michigan, and Louisiana State University, has gone into a second field season. Archeological Sites Survey cards based on the 1934 Smithsonian Institution Survey for the National Resources Board have been revised in the light of new data accruing since that date.

The primary objectives of both the historic sites survey and the archeological sites survey are to provide authentic information concerning outstanding sites of national significance and to develop means for their preservation through the cooperative efforts of Federal, State and local governmental units, and national, regional, and local historical, and patriotic societies.

Historic American Buildings Survey

The permanent graphic record of examples of architecture erected in the United States and its possessions prior to the last quarter of the nineteenth century was added to by virtue of authorization to expend PWA funds remaining from the previous year's allotment. This sufficed to finance a reduced Federal recording project and continuing supervisory cooperation with a number of State WPA recording projects of the Historic American Buildings Survey.

The original tripartite agreement entered into by the National Park Service, the Library of Congress, and the American Institute of Architects remains in effect. The material deposited in the Library of Congress embraces approximately 23,800 drawings and 28,100 photographs in record of more than 7,000 structures. A catalog of the subjects recorded to date, including a terse description and the numbers of drawings and photographs of each subject, is in process of being printed.

Planning and Construction

The planning and general development of new areas and the construction of buildings, roads, and bridges in established Service areas continued during the 1941 fiscal year on a limited basis.

The road and trail appropriation in the Interior Department Appropriation Act, made available the sum of \$2,125,000 in cash and authorized the contractual obligation of \$3,000,000 in addition. A portion of these funds was used for minor road and trail construction and improvement while the greater percentage was expended or obligated for the furtherance of major road projects which the Service constructs in collaboration with the Public Roads Administration. The major road work consisted of reconstruction of existing park roads, the continuation of grading and surfacing of park roads and approach roads, and the construction of bridges, tunnels, and guard rail together with post construction on other existing roads.

Facilities for camping were increased and improved in many of the parks and monuments with special attention being given to the accommodation of trailers. At Boulder Dam National Recreational Area a large scale planting project was started in connection with the Boulder Beach campground and lodge areas, which are being developed on the shore of Lake Mead. The rugged interior of Olympic National Park, Wash., was made more accessible and safer for pedestrians and equestrians by improvements to the trails and construction of trail-side shelters. The development of an administrative headquarters area was started at Arches National Monument, Utah.

Noteworthy among buildings completed were an administration building and the first unit of a concession building at Statue of Liberty

National Monument, an administration-museum building and a superintendent's residence at Kings Mountain National Military Park, an administration building and a superintendent's residence at Olympic National Park, and a concession building at Muir Woods National Monument. Rehabilitations completed included the Old Philadelphia Custom House, Washington's Headquarters at Morristown, and the Pavilion at Vanderbilt Mansion National Historic Site.

Parkway Development

The construction of the Blue Ridge and Natchez Trace Parkways, pioneers in their respective fields of recreational and historical motor travel, continued under the collaborative supervision of the Public Roads Administration and the Service. Federal appropriation of \$2,000,000, plus authorization to contract for \$6,000,000 additional, provided a substantial construction program.

The 484-mile Blue Ridge Parkway now has 150 miles graded and hard surfaced and 170 miles additional graded or under grading contracts. The 140-mile continuous paved unit between Adney Gap south of Roanoke, Va., and Deep Gap, N. C., accommodated 750,000 visitors during the travel year. Development of recreational areas adjacent to the parkway road continued with CCC and ERA funds and work forces.

The 454-mile Natchez Trace Parkway now has 36 miles graded and surfaced and 60 additional miles graded or under construction in Mississippi. In Tennessee, 9 miles are under construction; and the first contract for construction of 5 miles in Alabama was advertised for bids to be opened early in July 1941. Survey and location work continued in the three States in collaboration with the Public Roads Administration.

Forest Protection and Fire Prevention

Forest fire record.—The good forest fire record built up by the Service for several years was marred in 1940 by the occurrence of a number of large fires in the northern Rocky Mountain region. This section experienced the greatest number of lightning fires in its history. The fire season began early and followed a winter of subnormal snow-fall. Little rain fell during the spring and the situation continued serious until late fall. The large number of fires set by lightning taxed to the limit the protection organizations of all agencies. Although it was possible to control most fires while small, 6 fires in remote sections of Yellowstone and 2 in Glacier caused considerable damage before they could be controlled. These 8 lightning fires and 2 man-caused

fires (one of which occurred in the East), accounted for most of the total burned area of 23,235 acres. This was next to the largest loss sustained during any year of the last decade.

Considerable cooperation was again extended on fires outside the parks. Over 56,900 man-hours (mostly CCC) of protection assistance were given to other agencies. The Service also received splendid cooperation and assistance from adjacent protection agencies.

More detailed statistics of the 1940 fire record are enumerated in the tables on pages 283 to 287.

Fire protection training.—Emphasis on fire protection training was continued during the year. The regular and seasonal protection personnel was given instruction in the prevention and suppression of fires, and in areas subject to possible large fires advanced overhead training was given. On several of the large fires personnel from other parks was used to provide needed overhead and to give these men additional experience and training.

Fire equipment.—To control fires efficiently, modern equipment is needed. The Service continued its procurement program to the extent permitted by limited funds. During the year several portable pumpers, hose, and considerable quantities of hand tools and other equipment were obtained. Two special tank fire trucks equipped with power-driven pumps were obtained for forest and building protection in Great Smoky Mountains and Kings Canyon National Parks. Additional radio equipment was procured to improve communication on fires. Fourteen fire danger stations equipped to indicate fire weather conditions were added in eight areas.

Fire detection systems.—Continued improvement in the fire detection systems within the national parks was provided by the installation of additional modern fire lookout structures in Glacier, Great Smoky Mountains, Isle Royale (2), Grand Canyon, Grand Teton, Yellowstone, Yosemite, Wind Cave, Bandelier, Lava Beds, and Shiloh.

Protection planning.—The accumulated records of fire protection of the last 10 years were carefully analyzed. Such analyses, based on experience, furnish information needed for planning and action, and for justifying annual estimates of fire protection needs. As a result, protection needs have been studied and recommendations have been made to improve the protection of the national park system.

CCC in forest protection.—As in previous years since the establishment of the CCC, that organization has continued to furnish the bulk of the personnel for fire suppression and construction of forest protection improvements. All enrollees under Service supervision are given careful training in fire suppression work, with special emphasis upon safety and organization. The corps continued to demonstrate its real value to conservation and is a great contribution to the protection of the parks.

Fire prevention.—Much study has been given to the prevention of fires in the parks. Habits of park visitors and employees have been studied in an attempt to find the cause behind the cause of fires. Smoker fires continue to present the most difficult problem, but encouraging progress is revealed in the downward trend in number of practically all types of preventable man-caused fires, despite increased park use.

Insect control.—In general, the satisfactory insect conditions in areas under the jurisdiction of the Service can be attributed to the regularity of systematic insect surveys, which detect infestations before serious epidemics can develop, and to the practice of initiating and maintaining control projects to keep existing infestations at a low status.

In most of the eastern parks reasonably satisfactory insect control was obtained principally by spraying. Severe cold weather again assisted in the control of the southern pine beetle infestation in Great Smoky Mountains. Japanese beetle infestations are building up in several eastern parks and colonies of the bacterial milky-white disease are being placed as a control measure.

In the Rocky Mountain region forest insect conditions vary. Continued control work has lessened the ravages of bark beetles in most areas, but in Grand Teton the infestation continues on a level comparable with 1938.

The effectiveness of sustained control work is evidenced in the Southwest where insect conditions can be considered endemic. The oak looper infestation in Mesa Verde National Park appears to have died out. Most of the parks in the Pacific Coast and northwestern States have experienced notable success in insect control work. Increased insect activity in Mount Rainier and Lassen Volcanic has necessitated more intensive control activities.

Tree diseases.—The relatively recent advance of the white pine blister rust to the sugar pine forests of California has created the greatest forest protection problem faced by the Service, with the exception of fire control. In the western national parks over a quarter of a million acres must be protected, of which initial control work has been accomplished on approximately 26 percent through 1940. In the Eastern States white pine blister rust is of longer standing and initial control work through 1940 has been completed on 95 percent of the 70,000 acres that must be protected.

Another tree disease of considerable importance received attention during the year. This is the newly discovered bacterial necrosis, which attacks saguaro, organ pipe, and senita cacti in the Southwest. Cooperative studies are being made as to the cause, mode of spread, and possible control methods.

Campground protection.—The dual problem of deterioration and

protection of the vegetation in public use areas continues to receive attention. Special studies are being made of the cause of this deterioration and remedial measures have been initiated with beneficial results in several of the western parks.

Tree preservation.—The decrease in CCC camps and supervisory assistance in the eastern parks has lessened the tree preservation programs in several of these areas, but acute needs were cared for where possible. Special work was carried on at the new Vanderbilt Mansion National Historic Site and maintenance programs were executed in a number of parks both in the East and in the West.

Forest nurseries and planting.—Forest tree nurseries were operated during the year in Great Smoky Mountains, Sequoia, Shenandoah, and Yellowstone. About 2,000,000 seedling trees were planted during the year on areas within the national park system. The stock was obtained either from our own nurseries or from nurseries of other agencies.

National Capital Parks

Intensification of use of all areas and facilities in the National Capital Parks reflected the rapid population growth of the District of Columbia and the increased tourist interest in the National Capital, both due to the national emergency. All national memorials and historic sites recorded increases in attendance, the Lincoln Memorial registering a gain of nearly 50 percent over the previous year. Recreational areas, highways, and other park facilities also felt the burden of heavy usage.

The Superintendent of National Capital Parks has been appointed to the District of Columbia Petroleum Conservation Committee. The administrative assistant to the Superintendent and the Chief of National Memorials and Historic Sites are serving on the District of Columbia Defense Council. Two park areas, one located in the Mall and the other in West Potomac Park, have been designated as sites for temporary national defense buildings.

Dumbarton Oaks Park, a 27-acre naturalistically landscaped valley, the historic Fort Washington reservation containing 343 acres, and the 14,300-acre Chopawamsic Recreational Demonstration Area, were the principal acquisitions to the park system during the year.

The Rosslyn Plaza, the Columbia Island traffic circle, and the reconstruction of the Chesapeake & Ohio Canal between Georgetown and Seneca, Md., were completed during the year.

Important progress was recorded on the Thomas Jefferson Memorial, the structure—not including the statue—being practically completed.

Contracts for the repair, replacement, and covering of the stairway and landings and for the installation of heat in the Washington Monument were executed. Roads were rebuilt, curbs and gutters installed,

and new sidewalks constructed in the Washington Monument grounds.

An important program for the improvement of lawn areas was initiated and all lawn areas throughout the park system were treated for the control of Japanese beetles. Demolition of the pump station in section 3, Rock Creek and Potomac Parkway, was completed, and plans prepared for the reconstruction of the parkway roads approaching and passing beneath the new Massachusetts Avenue Bridge.

The landscape treatment of the base of the Navy-Marine Memorial is nearing completion. Work is continuing on the development of major recreation centers. Both of these projects, which are being executed through the use of CCC and WPA labor, have been handicapped because of the diversion of the work forces to priority defense projects.

Principal events included the lighting of the National Community Christmas Tree by the President of the United States, the Independence Day Celebration in the Washington Monument grounds, the Japanese Cherry Blossom Festival, the Army Day Parade, the President's Cup Regatta, the symphony concerts at the Watergate Theater, and the National Schoolboy Patrol Parade.

Irving C. Root was appointed Superintendent, National Capital Parks, on January 2, 1941. The position had been vacant since August 1939.

Appropriations totaling \$2,063,937.00, including regular appropriations, funds for the maintenance of the White House, the operation of seven CCC camps, and several public works and roads and trails projects, were accounted for by the National Capital Parks during the year.

The total attendance in National Capital Parks during the fiscal year was approximately 58,000,000.

Civilian Conservation Corps Cooperation in Park Work

The National Park Service quota of 310 continental CCC camps at the beginning of the year was reduced to 293 in the fourth quarter. This reduction was caused primarily to make companies available for national defense purposes. An average of 304 camps, comprising 50,000 enrollees, were operated on 2 military areas, 90 national parks and monuments, 22 recreational demonstration areas, and 190 State county, and metropolitan parks.

During the last quarter 8 camps were operating exclusively on military areas, and 8 camps furnished details ranging from 25 enrollees to full companies for temporary assignment to similar areas. In addition, 12 camps furnished 25 to 80 enrollees a day for periods of 6 to 8 weeks to develop 13 Army recreation centers or rest camps near metro

politan centers in 10 States and the District of Columbia. As further aid to national defense, 5 airports in 5 States were constructed, enlarged or improved by CCC forces. Also, special selected training courses, related directly or indirectly to national defense, were available to enrollees on a voluntary basis, and regularly scheduled training courses in the various skills and techniques of general construction and development work were given to all enrollees.

Camps were terminated on 30 areas where recreational development had reached a stage sufficient to meet the essential requirements of the public, and camps were established and development begun on 13 new areas. Included in the latter group are Arches National Monument, Appomattox Courthouse National Historical Monument, and Kolomoki Mounds State Park, Ga.

Nine territorial CCC units, with an authorized strength of 1,400 enrollees, were operated in the following areas: One in Hawaii National Park, five in the Territory of Hawaii, and three in the Virgin Islands. Some of these units were housed in regular CCC camps where the Service provided both camp management and work supervision, while others functioned locally and required work supervision only.

Broad programs of conservation and recreation development were continued and many outstanding achievements were effected by CCC forces in the continental United States and in the Territories.

Recreational Demonstration Areas

Even though inadequate funds for administration and operation made it inadvisable to attract public attention to the recreational opportunities available on the 46 recreational demonstration areas, both camping and day use increased greatly over that of previous years.

Not only were the 100 organized camps in use throughout last summer, but approximately 1,000 organizations made use of the facilities for week-end and holiday camping throughout the year. Because of their natural beauty and proximity to densely populated centers, the picnic grounds of most of the areas were used to capacity. Tent camp sites for organized groups, public campgrounds, and bathing facilities also were used extensively.

Improvements accomplished, with ERA and CCC labor, include extensions of water and sewage systems, roads and trails, and construction of shelter and maintenance buildings, residences, latrines, cabins, and lodges. A few tracts of land were donated to help round out the areas.

The Kings Mountain and Cheraw Areas, and four of the Waysides in South Carolina were leased to the Division of State Parks of the South Carolina Forestry Commission for administration and operation

of the organized camps, refectories, and public bathhouses. State recreational directors supervised programs of activity that had a wholesome effect on adjoining communities.

Because of their proximity to military and industrial defense concentrations, these areas are being used more and more by men in the armed forces and industrial workers.

A bill, H. R. 2685, if enacted into law, will authorize the Secretary of the Interior, with the approval of the President, to convey or lease any or all of these areas to the States or to political subdivisions thereof, without consideration, when such grantees or lessees are prepared to administer, operate, and maintain them for public park and recreation purposes. A few of the States are in a position financially to assume this responsibility. It is hoped others will be able to provide necessary funds and organization so the objective of this legislation can be effected and such of these areas as properly can be included in State or local systems may take their place in the park and recreation systems of the States concerned.

Emergency Relief Act Projects

The Service received \$4,119,950 from the Emergency Relief Act for operation of 54 approved projects, on which were employed an average of 4,700 relief workers. Of these, 47 were development and conservation projects operating on 37 recreational demonstration areas, 1 national park, 5 national monuments, 2 sections of a national parkway, 1 national historical park, and 1 national seashore project. This was a decrease of approximately 30 percent in funds and workers, and 43 percent in operating projects from last year's totals.

The developments have included additional units of organized camps, simple park structures and recreational facilities, balanced with work for conservation and protection of the natural resources of water, soil, forests, and wildlife; and restoration and preservation of historical and scenic values. Many essential facilities to meet increased administrative and operating responsibilities were provided in recreational demonstration areas. Probably the most noteworthy physical accomplishment of the year with relief funds was construction of three additional units to the administration and museum building at Ocmulgee National Monument, Ga.

Seven white-collar projects were engaged in assembling, preparing, and disseminating information on travel and recreation facilities in the United States; mapping forestry data; performing research; preparing museum displays; providing guide service; and preparing material for publication on national parks, monuments, and other areas under the jurisdiction of the Service.

Public and Employee Safety

Fire protection and safety.—Surveys of fire protection for buildings, and public and employee accident hazards were conducted at Carlsbad Caverns, Glacier, Mesa Verde, Rocky Mountain, Shenandoah, Yellowstone, and Yosemite National Parks and a comprehensive report with recommendations was prepared for each. Such surveys are useful not only in the correction of existing defects but also in developing safe habits in operation and maintenance, and in planning for subsequent physical improvements.

Federal and non-Federal cooperation.—Cooperation in the leadership of the Federal Fire Council and Federal Interdepartmental Safety Council was continued during the year.

Through representation on important fire protection and safety committees of national scope, the Service has cooperated with non-governmental organizations in the development of standards in the interest of fire and accident prevention.

National defense.—The Chief of the Service's Safety Division cooperated with the United States Office of Education in its engineering defense training program. Two lectures on The Management Aspects of Fire Loss Prevention were given at George Washington University in the engineering defense course in Fire Protection Engineering, and assistance in other ways was given in promoting the course.

The Service has been listed as a Federal agency with which State and local organizations are to cooperate in matters of fire defense in the civilian defense program. The brochure on Civilian Defense published by the Division of State and Local Cooperation of the Office for Emergency Management contains an outline of the fire-defense problem.

Memorials

Jefferson National Expansion Memorial, St. Louis, Mo.—From July 1, 1940, to June 30, 1941, the employees of this memorial project were engaged in the final settlement for property by negotiation and court procedure. To date settlements for 438 parcels have been completed, of which 423 were settled by negotiations and agreements with the respective owners and 15 by condemnation suits. The aggregate of the amounts fixed for these 438 parcels is \$5,381,124. This compares with the aggregate of \$5,799,155 awarded for the same properties by the Commissioners appointed to report on the value of those properties. Thus the amount of settlements to date represents a saving of \$418,031 as compared with the awards of the court commissioners. Agreements covering 45 parcels remain to be reached, of which the aggregate of the awards by the court commissioners is \$1,177,181 and the corresponding amount paid into court with the declaration of taking is \$999,595.

Wrecking operations begun by general contract on February 1, 1940, were completed on May 15, 1941. All of the area has been cleared, except for two buildings and a number of storage tanks of which the final disposition has not been determined.

WPA projects for the restoration of the Old Rock House, for the general improvement of the area, for the widening of Third Street, and for the restoration of the Old Courthouse were approved during the fiscal year. Work on the Old Rock House was started in January and the project for general improvement of the area was started early in February. The progress of both projects to date has been satisfactory. Due to disagreements with the city of St. Louis in closing streets and alleys within the memorial area and inability to complete the general contracts on the Old Courthouse, this office was unable to start the WPA projects for widening Third Street and for restoration of the Old Courthouse during the fiscal year.

Following several conferences with the Terminal Railroad Association and the city of St. Louis, studies were begun by a representative of the railroads and a representative of the city of St. Louis toward the solution of the problem of removing the elevated and low level tracks on the wharf adjacent to the memorial area.

Thomas Jefferson Memorial, Washington, D. C.—At the close of the fiscal year the Thomas Jefferson Memorial was 98 percent completed. The only work remaining is pointing of the stonework. The Jefferson statue is scheduled for placing in 1943, the two hundredth anniversary of Jefferson's birth.

Mount Rushmore National Memorial, S. Dak.—Administration of Mount Rushmore National Memorial continued under the National Park Service, to which it was transferred on July 1, 1939. By agreement with the President and between the Service and the Memorial Commission, the Service has had no responsibility other than accounting for the expenditure of funds. After the death of Gutzon Borglum, sculptor of the four heroic figures, on March 6, 1941, his son, Lincoln Borglum, was appointed to supervise the work.

Division of Sanitation

Western.—Inspections of water supplies, sewage-treatment plants, garbage incinerators, swimming pools, food-handling places, and camp grounds were made in 18 national parks, 14 national monuments, the Boulder Dam National Recreational Area, 5 CCC camps in national parks, and 4 State and city parks developed under the supervision of the Service.

At the Public Health Service Laboratory in San Francisco, 54 bacteriological analyses were made of samples of water from parks and

monuments, and 28 reports of chemical analyses were submitted for supplies which required some form of chemical treatment.

In line with a general policy of progressive improvement of water supplies, 8 chlorinators were installed, 4 trails were moved away from streams furnishing domestic water, and recommendations were made for improving 15 other supplies.

The sewage-water reclamation plant at Grand Canyon National Park produced water for certain industrial purposes which from a bacteriological standpoint was comparable to drinking water, and the Merced River, which receives the effluent from the sewage-treatment plant in Yosemite Valley, showed no evidence of contamination.

Treatment plants at the North Rim of the Grand Canyon, Many Glacier in Glacier, and Old Faithful in Yellowstone, as well as some smaller plants, were placed in operation during the year.

Four small incinerators were constructed. The five large units constructed in 1940 demonstrated the efficiency of this type of incinerator which was designed especially for burning the wet garbage produced in the parks.

Eastern.—The activities of the Division of Sanitation in the East were devoted principally to areas in the Blue Ridge Parkway, Colonial National Historical Park, Chickamauga-Chattanooga National Military Park, and the National Capital Parks, including the Chopawamsic Recreational Demonstration Area.

A somewhat perplexing problem developed at the Peaks of Otter along the Blue Ridge Parkway because of the proposed developments on the headwaters of one of the streams supplying water to the town of Bedford, Va. Since most of the activities are only a short distance above one of the waterworks intakes, they constitute a real hazard to the safety of that part of the city supply involved.

Close supervision was given to the operation of the swimming pools on property of National Capital Parks in the District of Columbia. On the whole, the operation of the pools was good, although at times not entirely satisfactory because of the difficulty of maintaining chlorine residuals when there were many swimmers.

Expansion of the Federal Park System

During the fiscal year 1941 three national historic sites were added to the Federal park system. The boundaries of a number of existing areas were enlarged, and satisfactory progress was made on several outstanding projects. At the close of the year, the Federal park system had increased from 21,550,782 acres on June 30, 1940 to 21,609,289.63 acres on June 30, 1941, and comprised 164 areas, as follows: 26 national parks, 82 national monuments, 4 national historical parks, 11 national military parks, 7 national battlefield sites,

8 national historic sites, 1 national recreational area, 9 national memorials, 12 national cemeteries, 3 national parkways, and the National Capital Parks in the District of Columbia.

National Historic Sites Established: Jefferson National Expansion Memorial, Mo., 76.63 acres, September 16, 1940; Vanderbilt Mansion National Historic Site, N. Y., 211.65 acres, December 18, 1940; and Fort Raleigh National Historic Site, N. C., 16.45 acres, April 5, 1941.

Changes in existing Federal park areas: Kings Mountain National Military Park, S. C., was enlarged by 3,972 acres, transferred from the Kings Mountain Recreational Demonstration Project, July 11, 1940; National Capital Parks, Washington, D. C., enlarged by 14,080 acres, through the transfer of Chopawamsic Recreational Demonstration Area, Va., to that system on August 13, 1940; Fort Pulaski National Monument, Ga., enlarged by 5,000 acres, January 27, 1941.

On July 16, 1940, 3,052 acres were withdrawn from Hawaii National Park and transferred to the Secretary of War for military purposes.

Further Additions to Existing Federal Park Areas

The following lands were added to the Federal park system during the past year through establishment of new areas, adjustment of boundaries of existing areas, and acquisition of lands for authorized projects:

Acadia National Park.—Donations of 704.52 acres brought the total area of this park to 18,456.563 acres.

Atlanta Campaign Markers.—Donations of 0.51 acres increased the total acreage to 20.96 acres.

Badlands National Monument.—Donations of 36.06 acres and purchase of 438.15 acres, increased the Federal lands in this monument to 129,761.14 acres.

Black Canyon of the Gunnison National Monument.—Donations of 12 acres increased the Government-owned lands in this monument to 12,723.46 acres.

Blue Ridge Parkway.—Donations of 5,607.656 acres and transfer from the Department of Agriculture of 3,449.39 acres increased the lands acquired for the parkway to 33,657.766 acres.

Boulder Dam National Recreational Area.—Donations of 25.11 acres increased the lands in this area to 1,439,868.736 acres.

Carlsbad Caverns National Park.—Forty acres were acquired by exchange increasing the Federal-owned lands to 45,647.12 acres.

Chickamauga and Chattanooga National Military Park.—Donations of 8.96 acres increased the area of this park to 8,550.692 acres.

Colonial National Historical Park.—Donations of 0.69 acres and purchase of 244.88 acres increased the area of this park to 6,712.63 acres.

Crater Lake National Park.—The purchase of 1,874.36 acres increased Federal holdings in this area to 160,260.64 acres.

Custer Battlefield National Cemetery.—On July 1, 1940, this cemetery, containing 765.34 acres, was transferred from the War Department by Executive order.

Fredericksburg and Spotsylvania County Battlefields Memorial National Military Park.—Donations of 2 acres increased the area of this park to 2,401.306 acres.

Great Smoky Mountains National Park.—Donations of 228.14 acres and purchase of 17,232.19 acres increased Federal holdings to 456,826.205 acres.

Hot Springs National Park.—Donations of 2.75 acres and purchase of 1.50 acres increased the area of this park to 1,010.686 acres.

Mammoth Cave National Park.—The acquisition of 6,156.57 acres by donation and purchase increased the area of this park to 48,788.32 acres.

Natchez Trace Parkway.—Donations of 530.443 acres increased lands acquired for the parkway to 10,344.582 acres.

Petrified Forest National Monument.—The acquisition of 7,769.99 acres by exchange and a recomputation of the area increased Federal lands to 85,234.72 acres.

Rocky Mountain National Park.—Purchase of 411.583 acres increased this area to 252,484.983 acres.

Wupatki National Monument.—Elimination of 52.27 acres by proclamation, January 22, 1941, decreased Federal holdings in this monument to 28,280.71 acres.

Proposed Extensions to Existing Federal Park Areas

Hawaii National Park, T. H.—Acquisition of 4,289 acres of private lands within the Kealakoma section of the park is provided for in Senate Joint Resolution No. 23, signed by Governor Poindexter on May 16, 1941. The Territorial Commissioner of Public Lands is directed to acquire these lands by purchase or condemnation.

George Washington Birthplace National Monument, Va.—The addition of approximately 2,000 acres, provided for in H. R. 18, introduced January 3, 1941, would place the waters of Pope's Creek under Service control and enable it to eliminate the shooting of waterfowl and other undesirable practices in the vicinity of the monument.

Kennesaw National Battlefield Site, Ga.—At present this area consists of the 60-acre Cheatham's Hill, on which the most desperate fighting took place during the battle of June 27, 1864. In 1935 Congress authorized enlargement of the area to include additional battle terrain, and a change in status to a national battlefield park. The enlarged boundaries aggregate approximately 3,000 acres, of which 2,592 acres have been acquired.

Status of Federal Park Areas Authorized by Congress

Big Bend National Park Project, Texas.—Authorized by act of June 20, 1935. In his message of January 16, 1941, to the Texas Legislature, Governor O'Daniel recommended that consideration be given to a plan for financing purchase of lands necessary for establishment of this area. In the same month a bill was introduced in the legislature authorizing an appropriation of \$1,500,000 to the Texas State Parks Board for acquisition of national park lands at prices and under conditions prescribed in the act approved May 12, 1939. The bill has passed both Houses and was signed by the Governor in July 1941.

Everglades National Park Project, Florida.—Authorized by act of May 30, 1934, only small isolated tracts of this 1,454,092-acre project are now in Federal ownership. On March 10, 1941, at a conference of interested Federal, State and private organizations in Tallahassee, Governor Holland indicated his desire to expedite establishment of the park. Subsequently, a bill was introduced in the legislature authorizing the proper officials to convey all State-owned lands, comprising approximately one-half of the authorized acreage, to the



PROPOSED GOOD NEIGHBOR PARK

A typical scene of spectacular stream erosion along the Rio Grande River near the village of Boquillas on the Texas-Mexican border in the Big Bend National Park Project. Ultimate plans for this area call for it to be an international "good neighbor" park lying in the United States and Mexico

Fish and Wildlife Service of this Department for protection and custody pending establishment of the national park.

Cape Hatteras National Seashore Recreational Area Project, N. C.—Authorized by act of August 17, 1937, and its designation changed by act of June 29, 1940. The approved boundaries aggregate approximately 62,500 acres, within which are the following Federal park areas, totaling 405 acres: Kill Devil Hill National Memorial, Cape Hatteras Lighthouse, Fort Raleigh National Historic Site. In 1939 North Carolina established the Cape Hatteras Seashore Commission to direct acquisition of State and private lands. During the past year the Commission has been examining titles and preparing deeds to lands held by Dare County for delinquent taxes which are to be transferred to the Commission for donation to the Federal Government.

Cumberland Gap National Historical Park Project, Ky., Tenn., and Va.—Authorized by act of June 11, 1940, this project embraces a maximum of 50,000 acres. In 1941, Tennessee appropriated \$75,000 for purchase of park lands within that State. The expenditure, however, was made contingent upon Kentucky and Virginia acquiring or obligating themselves by legislative action to acquire the park lands within their States.

Saratoga National Historical Park Project, N. Y.—Authorized by act of June 1, 1938. On February 7, 1941, the major portion of the lands within the designated boundaries were acquired when the Secretary of the Interior accepted title to 1,429 acres comprising the Saratoga Battlefield Reservation, donated by the State of New York. The Service is now engaged in acquiring the 950 acres of privately owned lands required for formal establishment of the park.

Andrew Johnson Homestead National Monument Project, Tenn.—Authorized by act of August 29, 1935. Representatives of this Service are now negotiating with the owners for purchase of the homestead. Congress last year appropriated \$44,500 for this purpose. In 1941, the General Assembly of Tennessee authorized conveyance of the site of the Andrew Johnson Tailor Shop to the Federal Government for national-monument purposes.

Proposed Additions to Federal Park System

Indian Mounds National Monument, Iowa.—Preservation of the Indian Mounds area near McGregor, Iowa, has been urged by many leading archeologists. The area contains some of the largest effigy mounds in the United States. In 1936, the Iowa Conservation Commission prepared a detailed report on the mounds and, during the past year, the State has been purchasing private lands within the boundaries designated by this Department.

Manuelito National Monument, N. Mex. and Ariz.—For many years the importance of further investigation of the ruins near Manuelito, N. Mex., as a means of obtaining a better understanding of the pre-Spanish Southwest, has been recognized. New Mexico has purchased the private holdings, other than Indian allotments, and has agreed to exchange State lands within the boundaries for Federal tracts outside the area. The State is also purchasing a number of Indian allotments embracing the more important prehistoric ruins.

Rehoboth-Assateague National Seashore, Del., Md., and Va.—H. R. 16, reintroduced on January 3, 1941, would authorize establishment of this national seashore when title to lands designated by the Secretary of the Interior shall have been vested in the United States. The area presents one of the best remaining opportunities to establish a national seashore which would be accessible to the heavily populated Middle Atlantic industrial region.

Tensas Swamp National Park, La.—Proposed by S. 329, reintroduced on January 14, 1941. An extensive swamp of primitive lower Mississippi River bottomland forest, inhabited by almost all the species of birds and animals native to the region, including many that are practically extinct elsewhere.

Lands Added to the Federal Park System

The following lands were added to the Federal Park System through establishment of new areas, adjustment of boundaries of existing areas, and acquisition of lands for authorized projects:

Acadia National Park.—Donations of 704.52 acres brought the total area of this park to 18,456.563 acres.

Atlanta Campaign Markers.—Donations of 0.51 acre were accepted for these markers.

Badlands National Monument.—Donations of 36.06 acres and purchase of 438.15 acres, making a total of 474.21 acres, added to the Federal lands in this monument.

Black Canyon of the Gunnison National Monument.—Donations of 12 acres increased the Government-owned land in this monument to 12,723.46 acres.

Blue Ridge Parkway.—Donations of 5,607.656 acres and transfer from the Department of Agriculture of 3,449.39 acres increased the land acquired for the parkway to 33,657.766 acres.

Boulder Dam National Recreational Area.—Donations of 25.116 acres increased the total holdings of Federal lands to 1,439,868.732 acres.

Carlsbad Caverns National Park.—Forty acres were acquired by

exchange increasing the Federal-owned lands in this park to 45,647.12 acres.

Chickamauga and Chattanooga National Military Park.—Donations of 8.96 acres increased the area of this park to 8,550.692 acres.

Colonial National Historical Park.—Donations of 0.69 acre and purchase of 244.88 acres increased the area of this park to 6,712.636 acres.

Crater Lake National Park.—The acquisition of 1,874.36 acres by purchase increased the holdings of Federal lands in this park to 160,260.64 acres.

Custer, Battlefield National Cemetery.—This cemetery containing 765.34 acres was transferred by Executive order from the War Department.

Fort Pulaski National Monument.—Donations of 5,000 acres increased the area of this monument to 5,427.39 acres.

Fredericksburg and Spotsylvania County Battlefields Memorial National Military Park.—Donations of 2 acres increased the area of this park to 2,401.306 acres.

Great Smoky Mountains National Park.—Donations of 228.14 acres and acquisition of 17,232.19 acres by purchase increased the area of this park to 456,826.205 acres.

Hawaii National Park.—Transfer of 3,052 acres to the War Department decreased the area of this park to 173,399.30 acres.

Hot Springs National Park.—Donations of 2.75 acres and the acquisition of 1.50 acres by purchase increased the area of this park to 1,010.686 acres.

Jefferson National Expansion Memorial. Donations of 1.44 acres and the acquisition of 71.585 acres by purchase completed the area of this memorial.

Kennesaw Mountain National Military Park.—The acquisition of 514.73 acres by purchase increased the area of this park to 2,592.63 acres.

Mammoth Cave National Park.—The acquisition of 6,156.57 acres by donation and purchase increased the area of this park to 48,788.32 acres.

Natchez Trace Parkway.—Donations of 530.443 acres increased the area of this parkway to 10,344.582 acres.

Petrified Forest National Monument.—The acquisition of 7,769.99 acres by exchange and a recomputation of the area of this monument increased the Federal-owned lands to 85,234.72 acres.

Rocky Mountain National Park.—The acquisition of 411.583 acres by purchase increased the Federal-owned lands in this park to 252,484.983 acres.

Wupatki National Monument.—Elimination of 52.27 acres by proclamation decreased the Federal-owned lands in this monument to 28,280.71 acres.

Recreation for British Sailors

Shortly before this report was printed the ban on public mention of American cooperation in the repairing of British naval vessels was lifted, so now it may be told how the National Park Service provided rest camps on recreational areas for British sailors whose ships were being refitted in American ports. Throughout the summer of 1941 the Service, through its Branch of Recreation and Land Planning, operated these camps in seven areas: Bear Brook Recreational Demonstration Area in New Hampshire; Townsend State Forest in Massachusetts; Burlingame Reservation in Rhode Island; Catoctin RDA in Maryland; Swift Creek RDA in Virginia; Crabtree Creek RDA in North Carolina; and Cheraw Recreational Demonstration Area in South Carolina. In addition to these, the Service has established, and is ready to operate, camps at French Creek RDA in Pennsylvania, and at Voorhees State Park and Glassboro Game Refuge in New Jersey.

The men were transported from their ships to the camps by the United States Navy. They came in groups of from 50 to 200 and stayed from 1 to 3 weeks. The Park Service provided living and sleeping quarters and all facilities; the United States Navy handled the Commissary; and the Royal Navy furnished the cooks. Three types of British sailors have used the camps—Regular, Reserves, and men comparable to the selectees in the American Army. Since the first camp was established in May approximately 8,000 men from about 25 ships have spent several days in the seven areas.

In this program, which is a phase of its contribution to the Nation's defense efforts, the Park Service had the cooperation of the Division of Recreation and Morale of the United States Navy and the British Advisory Repair Mission.

TABLE 1.—Holdings acquired for national park and monument purposes

Federal Park System	Holdings acquired from July 1, 1940, through June 30, 1941					Total ac- quired in acres	Holdings ac- quired prior to July 1, 1940	Total hold- ings ac- quired through June 30, 1941
	Holdings acquired by purchase		Holdings acquired otherwise than by purchase					
	Govern- ment funds	Donated funds	Area in acres	How acquired	Area in acres			
Acadia National Park				Donation	704,521	704,521	Acres 17,752,042	18,456,563
Atlanta Campaign Markers				do	510	510	20,960	20,960
Badlands National Monument	\$681.16		438.150	do	36,060	474,210	52,617,640	53,091,850
Black Canyon of the Gunnison National Monument				do	12,000	12,000	323,770	335,770
Blue Ridge Parkway				do	5,607,656			
				do	3,449,390	9,057,046	24,600,720	33,657,766
Boulder Dam National Recreational Area				Transferred	25,116	25,116	46,080	71,196
Carlsbad Cavern National Park				Donation	40,000	40,000	560,870	600,870
Chickamauga and Chatanooga National Military Park				Exchanged	8,960	8,960	8,541,732	8,550,692
Colonial National Historical Park				Donation	8,960	8,960	6,465,166	6,710,736
Colorado National Monument	26,116.00		244.880	do	40,000	245,570	424,200	464,200
Crater Lake National Park				do	40,000	140,000	8,239,400	10,113,760
Guster Battlefield Cemetery	6,560.26		1,874.360	do		1,874,360		1,874,360
Fort Pulaski National Monument				Transferred	765,340	765,340	427,390	5,427,390
Fort Raleigh National Historic Site				Donation	5,000,000	5,000,000	16,450	16,450
Fredericksburg and Spotsylvania County Battlefields Memo- rial National Military Park				do	2,000	2,000	2,399,306	2,401,306
Great Smoky Mountains National Park	335,331.20		17,232.190	do	228,140	17,460,330	439,365,875	456,826,205
Hawaii National Park				Transferred	-3,052,000	2-3,052,000		
Hot Springs National Park	9,109.43		1,500	Donation	2,750	4,250	86,895	91,145
Jefferson National Expansion Memorial	5,863,494.00	\$180,362.17	71,585	do	1,440	73,025	3,605	76,630
Kennesaw Mountain National Military Park	29,540.00		514.730	do		514,730	2,077,900	2,592,630
Kings Mountain National Military Park				Transferred	3,972,200	3,972,200	40,090	4,012,290
Mammoth Cave National Park	5,683.26	85,762.40	1,849.690	Donation	4,306,880	6,156,570	42,631,750	48,788,320
Natchez Trace Parkway				do	530,443	530,443	9,814,139	10,344,582
Olympic National Park	1,083,109.28		41,143.690	do	310	141,144,000	47,750	41,191,750
Petrified Forest National Monument				Exchanged	7,769,990	7,769,990	43,848,730	51,618,720
Rocky Mountain National Park	19,767.70		411.883	do				
Saratoga National Historical Park				Donated	1,427,850	1,427,850	5,376,400	5,787,983
Wupatki National Monument				Elimated	-52,270	2-52,270		
Acreage acquired in other areas prior to July 1, 1940							558,101.776	558,101.776
Total	7,379,392.29	266,124.57	63,782.358			97,731,054	1,223,813.676	1,321,544.730

¹ Outside.² Originally public domain.

TABLE 2.—Appropriations for administration, protection, and maintenance, expenditures therefrom, and revenues, fiscal year 1941

Appropriation item	Appropriated	Expenditures and obligations	Revenues received
Acadia	\$52,700	\$52,062.34	\$236.20
Bryce Canyon	18,910	18,731.09	18,069.00
Carlsbad Caverns	103,840	99,630.29	352,949.39
Crater Lake	89,400	89,550.91	59,370.62
Glacier	205,400	202,770.67	43,411.14
Grand Canyon	132,580	132,162.24	123,803.29
Grand Teton	28,940	28,676.05	11,936.97
Great Smoky Mountains	101,670	99,633.94	3,828.15
Hawaii	62,000	59,664.28	788.55
Hot Springs	73,670	73,133.09	38,805.25
Isle Royale	(1)	19,587.71	1,148.90
Kings Canyon	33,405	33,668.61	18,578.79
Lassen Volcanic	52,590	52,485.05	21,054.16
Mammoth Cave			1,511.81
Mesa Verde	58,215	57,926.38	10,478.72
Mount McKinley	28,120	25,441.13	1,006.52
Mount Rainier	150,300	150,202.27	61,746.79
National Capital Parks:			
United States	289,900	286,671.13	66,132.41
District of Columbia	925,442	903,658.72	52,909.59
Olympic	54,400	54,234.95	1,793.75
Platt	24,075	20,452.71	29.00
Rocky Mountain	97,455	96,331.27	73,700.00
Sequoia	126,165	124,988.41	67,304.85
Shenandoah	93,610	92,620.95	79,975.27
Wind Cave	22,200	22,096.71	11,770.43
Yellowstone	461,960	455,350.44	474,975.84
Yosemite	340,695	342,305.73	391,697.01
Zion	49,870	49,610.47	32,145.37
National Monuments	342,795	340,621.75	62,188.65
National Historical Parks and Monuments	261,325	199,710.45	14,261.23
Patrick Henry National Monument	25,000	25,000.00	
Andrew Johnson National Monument	44,500	44,000.00	
National military parks, battlefields, monuments and cemeteries	409,770	398,129.44	63,708.54
Boulder Dam National Recreational Area	103,980	103,480.06	1,832.57
National Park Service	270,000	267,841.32	
Regional offices	34,000	32,758.04	1,071.06
General expenses, National Park Service	36,500	37,828.55	
Emergency reconstruction and fighting forest fires	150,000	159,950.65	
Forest protection and fire prevention	123,500	123,377.85	
Roads and trails	2 2,125,000	3,907,626.49	
Blue Ridge and Natchez Trace Parkways	2 2,000,000	5,706,913.52	1,561.38
Physical improvements	170,750	159,659.41	
Historic sites and buildings	20,000	19,894.58	
Investigation and purchase of water rights	39,840	17,721.52	
Development of grounds, Thomas Jefferson Memorial, Washington, District of Columbia	375,000	222,850.94	
Mount Rushmore National Memorial Commission	86,000	59,715.10	
Jefferson National Expansion Memorial			13,302.15
Recreational demonstration areas			28.00
Miscellaneous			7.48
Total	10,295,472	15,470,736.21	2,179,118.83

¹ No appropriation made for 1941, however, the unobligated balance of the 1940 appropriation was continued available for 1941.

² Available until expended.

TABLE 3.—Summary of appropriations for the administration, protection, maintenance and improvement of areas under the jurisdiction of the National Park Service, together with the revenues received, for the fiscal years 1917¹ to 1941, inclusive

Year	Department	Appropriation	Revenues
1917	Interior Department	\$533,466.67	
	War Department	247,200.00	
		\$780,666.67	\$180,652.30
1918	Interior Department	529,780.00	
	War Department	217,500.00	
		747,280.00	² 217,330.53

See footnotes at end of table.

TABLE 3.—Summary of appropriations for the administration, protection, maintenance and improvement of areas under the jurisdiction of the National Park Service, together with the revenues received, for the fiscal years 1917 to 1941 inclusive—Continued

Year	Department	Appropriation		Revenues
1919	Interior Department.....	\$962,205.00		
	War Department.....	50,000.00		
1920	\$1,012,205.00	\$196,678.03	
1921	907,070.76	316,877.96	
1922	1,058,969.16	396,928.27	
1923	1,533,220.00	432,964.89	
1924	1,579,520.00	513,706.36	
1925	1,759,601.00	663,886.32	
1926	3,027,657.00	670,920.98	
1927	3,258,409.00	820,454.17	
1928	3,933,520.00	703,849.60	
1929	4,874,685.00	808,255.81	
1930	4,771,515.00	849,272.95	
1931	7,890,321.00	1,015,740.56	
1932	15,289,435.00	940,364.79	
1933	9,595,250.00	820,654.19	
1933-41	10,820,620.00	628,182.06	
1934	47,507,314.64	-----	
1935	8,957,976.00	731,331.80	
1936	12,663,541.38	907,189.96	
1937	18,830,280.00	1,136,533.68	
1938	17,595,805.00	1,398,691.66	
1939	22,590,260.00	1,504,561.84	
1940	26,959,977.29	1,567,333.70	
1941	13,557,815.00	1,929,013.63	
	10,295,472.00	2,179,118.83	

¹ For summary of appropriations and revenues prior to 1917, see 1920 Annual Report, p. 359.

² The revenues from the various national parks were expendable during the years 1904 to 1918, inclusive, with the exception of those received from Crater Lake, Mesa Verde, and Rocky Mountain National Parks the revenues from which were turned into the Treasury to the credit of miscellaneous receipts.

TABLE 4.—Annual fire report, January 1, 1940, to December 31, 1940

Name	Classification					Point of origin				Causes of fires								Grand total		
	A	B	C	D	E	Total	Inside parks		Outside parks		Lightning	Campfires	Smokers	Debris burning	Incendiary	Lumbering	Railroads		Miscellaneous	Total man-caused
							On Government land	On private land	Entered park	Confined to outside areas										
REGION I																				
National parks:																				
Acadia	13	11				24	16			8		1		18	1	3		1	24	24
Great Smoky	8	13				30	14			12	6			10	4	4		4	24	30
Mammoth Cave	8	4	2		1	17	12	1	3	1	1			8	4	2		2	16	17
Shenandoah	2	4				6	3			3				3		2		1	6	6
Military and historical parks:																				
Chickamauga-Chatanooga	17	9	1			27	22		1	4				14	2	2	7	1	27	27
Colonial	4	3				5	4			1				5					5	5
Kennesaw Mountain	3	3				6	1	2		3				1			4	1	6	6
Morristown	1	2				3	2		1	1				4					6	6
Ocmulgee	2	4				6	4		1					1		1			3	3
Petersburg		1	1			3			1	2				1					1	1
Richmond		1				1	3		1	2				5		1		1	6	6
Shiloh	2	4				6	3			2				2		8	1	2	3	3
Stones River		3				3				3				31					44	44
Vicksburg	30	14				44	36		5					2						
National parkways:																				
Blue Ridge	1	11			1	13	6		1	6	1	2	3	3	2	4		1	12	13
Natchez Trace		17	16			33	13		17	3		3		14	13			2	33	33
Total	91	102	27	5	2	227	140	6	32	49	8	8	119	32	27		15	18	219	227
REGION II																				
National parks:																				
Grand Teton	8	3				11	6			5		1		5					6	11
Rocky Mountain	12	1				13	8			3		2		7	2				11	13
Wind Cave	4					4	2	1		1		4		15	1			4	23	24
Yellowstone	42	10	5			64	64					3							40	64
Total	66	14	5		7	92	80	3		9	52	6	27	3				4	40	92

REGION III

[illegible]

REGION IV

[illegible]

TABLE 4.—Annual fire report, January 1, 1940, to December 31, 1940—Continued

Burned area inside parks (nearest whole acre)				Timber de- stroyed inside park	Cost of fire suppression (to nearest whole dollar)									
Forest	Brush	Grass	Total		Per- sonal services	Sup- plies, trans- porta- tion, etc.	Equip- ment	Indirect costs pro- rated	Total	Salaries of park employees not paid from F. F. F.	Grand total	CCC man- hours contrib- uted	Value of CCC contri- bution	Value of other contri- bution
REGION I														
National parks:														
Acadia	15	1		16										
Great Smoky	313		2	313	5		76	81	206	287	55	2,629	745	33
Mammoth Cave	213		549	762	18		24	24	128	30	152	3,412	963	23
Shenandoah	3		1	4							30	1,663	456	5
Military and historical parks:														
Chickamauga-Chattanooga	5	3	3	8							31	31	230	63
Colonial	3	1	1	4							11	11	108	30
Kennesaw Mountain											1	1	155	48
Morristown											1	1	43	15
Ocmulgee		21	11	32							1	1	174	57
Petersburg	3			3							6	6	30	10
Richmond			4	4							3	3	101	39
Shiloh			2	3							6	6	39	1
Stones River		1	9	9							6	6	101	39
Vicksburg											21	21	1,230	375
National parkways:											38	38		28
Blue Ridge	10	4	4	18										100
Natchez Trace	110	8	79	197										285
Total	673	35	669	1,377	18	5	100		105	537	642	19,303	5,420	
REGION II														
National parks:														
Grand Teton	10		1	11	2	34	97	33		164	149	313	736	190
Rocky Mountain											52	52	159	48
Wind Cave											15	15	106	30
Yellowstone	19,704	1	915	20,624	63,147	47,623	55,321	4,354		107,293	6,708	114,006	110,239	32,182
Total	19,715	5	916	20,636	63,149	47,657	55,418	4,387		107,462	6,924	114,386	111,240	32,450

REGION III

National parks:

Bryce Canyon	5	5	27	20	70	145	36	30	281	16	138	35	26
Grand Canyon	22	5	12							188	2,866	772	44
Hot Springs	12									101	27	99	
Mesa Verde										27	362		
Platt										3	3	8	6
Zion	1	1	2							3	25		3
National monuments:													
Bandelier	3		3	1		6			6	29	35	520	137
Colorado											134	38	
Saguaro	24		24	31	34	20	3	6	63	26	89		8
Total	62	5	73	52	104	171	39	36	350	394	744	1,089	87

REGION IV

National parks:

Crater Lake										44	209	56	
Glacier	918	1	2	921	16,092	16,730	2,334		35,156	2,039	37,795	16,352	352
Hawaii		2	2							24	24	371	101
Kings Canyon	43		43	50	25	95	5		125	30	155	2,331	453
Lassen Volcanic	2		2	1						52	52	2,376	654
Mount McKinley	80	10	90		335	91			426	136	562		200
Mount Rainier										20	20	130	38
Olympic	1		1		187	22			209	148	357	1,048	272
Sequoia	8		8		64	3			67	51	118	110	31
Yosemite	78	2	80	640	7	118	1,030	94	1,849	303	2,152	11,109	2,997
National monuments:													
Lava Beds										10	10	182	52
Pinnacles		2	2							11	11		
Total	1,130	3	16	1,149	16,710	17,059	3,969	94	37,832	3,468	41,300	127,946	603
National Capital Parks													
Grand total	21,580	48	1,007	23,235	74,660	64,476	8,495	130	145,749	11,323	157,072	263,764	1,803

TABLE 5.—Interpretive services recorded under the naturalist program

TOTALS, FISCAL YEAR 1941

	Interpretive naturalist personnel				Total number of visitors using interpretive services	Total V. P. H. ¹	Total visitors
	Permanent		Temporary				
	Naturalist	Other	Naturalist	Other			
National parks:							
Acadia.....	1	0	3	0	46,216	-----	107,240
Bryce Canyon.....	0	0	2	0	101,080	-----	264,052
Carlsbad Caverns.....	0	12	0	16	235,184	-----	254,754
Crater Lake.....	1	0	8	0	129,610	-----	165,165
Glacier.....	1	0	10	1	187,855	-----	414,055
Grand Canyon.....	2	0	5	0	274,089	-----	102,468
Grand Teton.....	1	0	3	3	75,522	-----	995,114
Great Smoky Mountains.....	1	0	2	0	17,289	-----	304,422
Hawaii.....	1	0	0	6	236,237	-----	165,677
Hot Springs.....	0	1	0	0	30,386	-----	193,295
Lassen Volcanic.....	1	1	5	0	62,395	-----	123,510
Mammoth Cave.....	0	0	1	0	79,337	-----	799
Mount McKinley.....	0	4	1	0	2,602	-----	481,896
Mount Rainier.....	1	0	9	1	319,280	-----	65,350
National Capital.....	1	0	0	0	41,289	-----	629,433
Olympic.....	0	1	1	6	564	-----	284,225
Rocky Mountain.....	1	2	5	0	182,204	-----	1,025,230
Sequoia.....	1	0	9	0	329,125	-----	39,865
Shenandoah.....	0	1	0	1	5,819	-----	538,347
Wind Cave.....	0	2	0	0	33,845	-----	539,728
Yellowstone.....	3	0	20	0	1,842,305	-----	169,049
Yosemite.....	3	1	12	3	858,196	-----	761,512
Zion.....	1	0	2	0	115,751	-----	7,531,186
Other areas:						-----	
Boulder Dam.....	4	6	1	2	98,339	-----	5,304,529
Total.....	24	31	99	39	5,304,529	-----	13,516
National monuments:						-----	
Cedar Breaks.....	0	0	0	1	5,734	-----	87,220
Death Valley.....	1	3	0	4	43,069	-----	7,912
Dinosaur.....	0	0	0	3	7,826	-----	32,098
Lava Beds.....	0	2	0	3	28,978	-----	1,441
Lehman Caves.....	0	1	0	0	1,249	-----	128,360
Muir Woods.....	0	2	0	2	134,039	-----	

BREAK-DOWN OF ACTIVITIES, FISCAL YEAR 1941

Oregon Caves.....	0	0	0	0	1	16,465	40,860
Petrified Forest.....	2	0	2	0	0	192,274	231,327
Timpanogos Cave.....	0	1	0	0	5	15,830	11,248
Total.....	3	9	2	19		445,464	553,982
Southwestern national monuments:							
Arches.....	0	1	0	0	0	1,654	3,055
Capulin Mountain.....	0	1	0	0	0	7,544	33,025
Chiricahua.....	0	1	0	0	0	4,198	12,147
Natural Bridges.....	0	1	0	0	1	372	821
Organ Pipe Cactus.....	0	1	0	0	0	356	10,490
Saguaro.....	0	1	0	0	0	3,950	13,158
Sunset Crater.....	0	1	0	0	0	2,239	11,929
White Sands.....	0	2	0	0	0	44,408	68,767
Total.....	0	9	0	0	1	64,721	153,392
Washington and regional staffs							
Grand total.....	27	49	101	59		5,835,577	8,238,560

	Guided trips			Lectures			Attended stations			Unattended stations		
	Number	Attendance	V. P. H. ¹	Number	Attendance	V. P. H. ¹	Number	Attendance	V. P. H. ¹	Number	Attendance	V. P. H. ¹
National parks:												
Academe.....	136	4,601		55	9,395		5	32,220		0	0	
Bryce Canyon.....	292	15,390		285	63,218		0	0		1	22,472	
Carlsbad Caverns.....	715	212,341		188	22,843		0	0		0		
Crater Lake.....	182	3,007		519	36,896		3	86,062		3	3,945	
Glacier.....	353	16,138		404	23,945		1	68,322		2	77,290	
Grand Canyon.....	355	23,135		1,284	119,521		3	123,289		3	8,164	
Grand Teton.....	170	3,019		98	14,267		1	48,076		1	10,160	
Great Smoky Mountains.....	244	6,390		82	10,361		1	538		0	0	
Hawaii.....	314	7,184		293	17,899		1	24,304		5	86,890	
Hot Springs.....	0			1	1,273		1	28,463		1	660	
Lassen Volcanic.....	191	7,712		104	21,530		3	30,003		1	3,150	
Mammoth Cave.....		75,619		75	3,718		0	0		0	0	
Mount McKinley.....	8	117		26	2,485		0	0		0	0	
Mount Ranier.....	326	5,627		520	30,018		5	220,758		5	62,877	
National Capital.....	144	8,832		71	26,707		0	0		1	5,750	
Olympic.....	2	9		25	555		0	0		0	0	
Rocky Mountain.....	323	9,555		362	34,725		3	114,197		1	23,727	
Saguaro.....	866	24,119		747	152,787		4	38,149		3	114,070	
Shenandoah.....	34	941		48	4,878		0	0		0	0	

See footnotes at end of table.

TABLE 5.—Interpretive services recorded under the naturalist program—Continued
BREAK-DOWN OF ACTIVITIES, FISCAL YEAR 1941—Continued

	Guided trips			Lectures			Attended stations			Unattended stations		
	Number	Attendance	V. P. H.	Number	Attendance	V. P. H.	Number	Attendance	V. P. H.	Number	Attendance	V. P. H.
National Parks—Continued.												
Wind Cave.....	658	23,008	---	7	625	---	1	7,212	---	1	3,000	---
Yellowstone.....	1,641	85,075	---	1,752	338,865	---	7	1,025,268	---	5	393,097	---
Yosemite.....	610	25,390	---	2,163	451,119	---	5	328,337	---	3	53,350	---
Zion.....	231	11,265	---	303	78,594	---	1	20,345	---	1	5,547	---
Other areas:												
Boulder Dam.....	278	6,485	---	768	35,754	---	5	56,100	---	0	0	---
Total.....	8,303	574,979	---	10,253	1,503,678	---	59	2,251,823	---	37	974,049	---
National monuments:												
Cedar Breaks.....	7	50	---	142	1,756	---	1	3,928	---	0	0	---
Death Valley.....	0	0	---	291	21,151	---	5	7,362	---	1	14,556	---
Dinosaur.....	803	3,486	---	772	3,940	---	0	0	---	1	400	---
Lava Beds.....	1,362	9,453	---	7	1,005	---	1	10,749	---	2	7,771	---
Lehman Caves.....	1,185	1,095	---	2	31	---	1	123	---	0	0	---
Muir Woods.....	1,184	18,523	---	0	0	---	0	0	---	2	115,516	---
Oregon Caves.....	13	915	---	0	2,550	---	0	0	---	0	0	---
Petrified Forest.....	3,479	13,915	---	1,011	21,508	---	1	94,178	---	2	73,109	---
Timpanogos Cave.....	1,110	11,298	---	24	1,123	---	1	3,409	---	0	0	---
Total.....	4,798	61,299	---	2,249	53,064	---	10	119,749	---	8	211,352	---
Southwestern national monuments:												
Archae.....	268	1,245	---	51	409	---	0	0	---	0	0	---
Capulim Mountain.....	12	204	---	2	153	---	1	1,050	---	5	6,140	---
Chiricahua.....	161	1,114	---	626	2,553	---	1	531	---	0	0	---
Natural Bridges.....	66	300	---	0	0	---	1	72	---	0	0	---
Organ Pipe Cactus.....	22	41	---	3	30	---	1	285	---	0	0	---
Saguaro.....	43	229	---	2	315	---	1	3,399	---	2	2,239	---
Sunset Crater.....	0	0	---	0	0	---	0	0	---	1	26,352	---
White Sands.....	1	17	---	1,287	9,200	---	3	8,809	---	1	34,768	---
Total.....	573	3,150	---	1,971	12,657	---	8	14,146	---	9	34,768	---
Washington and regional staffs:	1	23	---	46	20,840	---			---			---
Grand total.....	13,675	639,451	---	14,519	1,590,239	---	77	2,385,718	---	54	1,220,169	---

1 V. P. H.—Visitor participation hours. This figure is obtained by multiplying the visitor attendance by the average duration of the contact; i. e., the average time devoted to the lecture, museum visit, or use of interpretive stations.

TABLE 6.—Statement showing work accomplished at Civilian Conservation Corps camps under the jurisdiction of the National Park Service, July 1, 1940, to June 30, 1941

Item	Total work accomplished July 1, 1940, to June 30, 1941				
	New construction				Main-tenance
	Unit	National parks and monuments ¹	State parks	Combined total national parks and State parks	National parks and monuments
Bridges:					
Foot and horse	Number	10	33	43	6
Vehicle	Number	6	24	30	104
Barns	Number	2	5	7	4
Bathhouses	Number		31	31	
Cabins, overnight	Number		251	251	
Combination buildings	Number	1	28	29	
Dwellings	Number	54	29	83	262
Equipment and supply storage houses	Number	28	239	267	26
Garages	Number	15	9	24	1
Latrines and toilets	Number	86	142	228	72
Lodges and museums	Number	3	7	10	9
Lookout houses	Number	2	2	4	5
Lookout towers	Number	3		3	10
Shelters	Number	26	57	83	
Other buildings	Number	361	1,034	1,395	495
Cribbing, including filling	Cubic yards	815	7,400	8,215	
Impounding and large diversion dams	Number	1	7	8	
Fences	Rods	16,741.7	25,950.7	42,692.4	5,047.1
Guard rails	Rods	1,685	7,224.1	8,909.1	912
Leaves, dykes, jetties, and groins	Cubic yards	14,935	29,370	44,305	
Power lines	Miles	22.4	40.7	63.1	41.6
Incinerators	Number	7	7	14	2
Sewage and waste disposal systems	Number	78	586	664	89
Telephone lines	Miles	239.3	100.5	339.8	924.9
Fountains, drinking	Number	37	143	180	
Open ditches	Linear feet				1,700
Pipe or tile lines	Linear feet	135,347	357,629	492,976	28,664
Storage facilities (omit last 000)	Gallons	436.2	928.7	1,364.9	
Wells, including pumps and pump-houses	Number	27	41	68	
Miscellaneous water-supply systems	Number	91	94	185	5
Camp stoves or fireplaces	Number	299	1,394	1,693	11
Cattle guards	Number	4	10	14	
Corrals	Number	5	3	8	
Seats	Number	89	381	470	20
Signs, markets, and monuments	Number	12,744	2,934	15,678	1,486
Stone walls	Rods	463.2	1,479.6	1,942.8	1,500
Table and bench combinations	Number	613	2,825	3,438	64
Tool boxes	Number	52	57	109	
Miscellaneous structural improvements	Number	580	5,123	5,703	78
Radio stations	Number	5		5	23
Springs	Number	16	4	20	
Small reservoirs	Number	4	4	8	6
Landing docks and piers	Number	4	30	34	
Airplane landing fields	Number				1
Truck trails or minor roads	Miles	94.2	177.3	271.5	2,288
Foot trails	Miles	82	76.6	158.6	409
Horse or stock trails	Miles	75.9	53.7	129.6	1,695.9
Stream and lake bank protection	Square yards	5,500	17,786	23,286	580
Bank sloping	Square yards	300,387	158,535	458,922	444,493
Check dams:					
Permanent	Number	305	97	402	
Temporary	Number	1,857	218	2,075	
Seeding and sodding	Square yards	306,961	32,824	339,785	305,212
Tree planting, gully	Square yards	703,790	2,875	706,665	
Ditches, diversion	Linear feet	6,249	2,695	8,944	1,060
Terracing	Miles		0.1	0.1	
Terrace outlet structures	Number		1	1	
Wind erosion area treated	Acres		1.5	1.5	
Water spreaders (rock, brush, wire)	Linear feet		1,935	1,935	
Clearing and cleaning:					
Channels and levees	Linear feet	1,800	75,652	77,452	
Reservoir, pond, and lake sites	Acres	45	504	549	
Lining of waterways	Square yards	100		100	
Excavating channels, canals, ditches:					
Earth	Cubic yards	115,153	564,478	679,631	
Rock	Cubic yards		2,546	2,546	

See footnote at end of table.

TABLE 6.—Statement showing work accomplished at Civilian Conservation Corps camps under the jurisdiction of the National Park Service, July 1, 1940, to June 30, 1941—Continued

Item	Total work accomplished July 1, 1940, to June 30, 1941				
	New construction				Main-tenance
	Unit	National parks and Monuments ¹	State parks	Combined total national parks and State parks	National parks and Monuments
Pipe and tile lines and conduits.....	Linear feet.....	23, 271	41, 899	65, 170	-----
Riprap or paving:					-----
Rock or concrete.....	Square yards.....	16, 305	33, 471	49, 776	-----
Brush or willows.....	Square yards.....	13, 500	-----	13, 500	-----
Water control structures other than dams.....	Number.....	45	669	714	-----
Field planting or seeding (trees).....	Acres.....	3, 205	22, 287. 7	25, 492. 7	2, 806. 2
Forest stand improvement.....	Acres.....	-----	62	62	-----
Nurseries.....	Man-days.....	25, 507	39, 924	65, 431	9, 657
Tree seed collection:					-----
Conifers (cones).....	Bushels.....	265	2, 705	2, 970	-----
Hardwoods.....	Pounds.....	2, 972	16, 122	19, 094	-----
Collection of tree seedlings.....	Number.....	-----	6, 000	6, 000	-----
Fighting forest fires.....	Man-days.....	33, 369	14, 482	47, 851	-----
Fire breaks.....	Miles.....	31. 8	75. 9	107. 7	59. 7
Fire hazard reduction:					-----
Roadside and trailside.....	Miles.....	197	62. 2	259. 2	-----
Other.....	Acres.....	5, 927. 3	12, 790. 5	18, 717. 8	-----
Fire suppression.....	Man-days.....	94, 183	87, 789	181, 972	-----
Fire prevention.....	Man-days.....	806	353	1, 159	-----
Tree and plant disease control.....	Acres.....	25, 422. 1	11, 734	37, 156. 1	744
Tree insect pest control.....	Acres.....	15, 442. 5	19, 557. 5	35, 000	6, 889
Beach improvement.....	Acres.....	11. 2	63. 8	75	59
General clean-up.....	Acres.....	198	-----	198	-----
Landscaping, undifferentiated.....	Acres.....	5, 416	5, 641. 1	11, 057. 1	662. 7
Moving and planting trees and shrubs.....	Number.....	257, 562	933, 297	1, 190, 859	29, 159
Parking areas and parking overlooks.....	Square yards.....	106, 943	501, 342	608, 285	6
Public campground development.....	Acres.....	1, 374. 5	352. 3	1, 726. 8	1, 750. 7
Public picnic ground development.....	Acres.....	43. 4	1, 137. 2	1, 180. 6	155. 2
Razing undesired structures and obliteration.....	Man-days.....	65, 070	81, 924	146, 994	-----
Seed collection (other than tree).....	Pounds.....	635	251	886	-----
Seeding and sodding.....	Acres.....	350. 4	956. 1	1, 306. 5	3, 342. 4
Soil preparation.....	Acres.....	592. 9	822. 8	1, 415. 7	-----
Vista or other selective cutting for effect.....	Acres.....	735. 1	1 089. 7	1, 824. 8	-----
Walks; concrete, gravel, cinder.....	Linear feet.....	10, 173	56, 545	66, 718	17, 066
Elimination of livestock and predators.....	Number.....	196	-----	196	-----
Fish rearing ponds.....	Number.....	-----	1	1	52
Food and cover planting and seeding.....	Acres.....	130	5. 3	135. 3	-----
Lake and pond development.....	Man-days.....	4, 244	24, 455	28, 699	-----
Stocking fish.....	Number.....	1, 055, 590	-----	1, 055, 590	-----
Stream development (wildlife).....	Miles.....	2. 9	0. 3	3. 2	-----
Other wildlife activities.....	Man-days.....	11, 501	8, 263	19, 764	23
Wildlife feeding.....	Man-days.....	-----	147	147	-----
Education, guide, contact station work.....	Man-days.....	48, 914	2, 394	51, 308	-----
Emergency work.....	Man-days.....	20, 766	30, 045	50, 811	-----
Eradication of poisonous weed or exotic plants.....	Acres.....	641. 7	981	1, 622. 7	-----
Insect pest control.....	Acres.....	-----	260	260	-----
Maps and models.....	Man days.....	3, 598	1, 611	5, 209	2
Marking boundaries.....	Miles.....	320. 8	147. 6	468. 4	3
Mosquito control.....	Acres.....	3, 520. 2	132	3, 652. 2	-----
Preparation and transportation of materials.....	Man-days.....	230, 269	298, 277	528, 546	-----
Reconnaissance and investigation:					-----
Archeological.....	Man-days.....	16, 127	22, 322	38, 449	-----
Other.....	Man-days.....	4, 091	13, 909	18, 000	-----
Restoration of historic structures.....	Number.....	73	15	88	-----
Surveys.....	Man-days.....	28, 713	41, 678	70, 391	-----
Tree preservation.....	Man-days.....	12, 570	19, 116	31, 686	-----
Equipment repair or construction.....	Man-days.....	3, 358	1, 426	4, 784	-----
Hydraulic research.....	Man-days.....	2, 782	-----	2, 782	-----
Warehousing.....	Man-days.....	6, 937	3, 608	10, 545	-----
Technical service camp buildings.....	Number.....	22	30	52	6
Central repair shop labor.....	Man-days.....	12, 508	19, 327	31, 835	-----
Unclassifiable.....	Man-days.....	268	100	368	-----

¹ This includes work on 24 recreational demonstration areas.



IRA N. GABRIELSON, Director

Wildlife and the American Way of Living

"WHEN I come back this time," wrote a World War veteran who was reentering the service in 1940, "I hope that I shall find America to be still the America of my boyhood dreams, a nation where a man of reasonable intelligence, energy, and integrity can achieve a happy life. Loving the outdoors, I should hate to find that our conservation program had been junked—not only because we should conserve the resources which have made America great, but also because I want again to fish clear streams and tramp through unspoiled fields and forests with a dog and a gun."

Printed in the winter 1940-41 issue of *Virginia Wildlife*, published by the Virginia Commission of Game and Inland Fisheries, this letter epitomizes an outstanding concern of the Fish and Wildlife Service ¹ during the first year of its existence.

"I want," said the soldier, "to come back to the America I have always known—an America of freedom, of opportunity, and of happy

¹ Formed on June 30, 1940, in accordance with the President's Reorganization Plan No. III, consolidating the Bureau of Biological Survey and the Bureau of Fisheries, which had both been transferred to the Department of the Interior on July 1, 1939, in accordance with Reorganization Plan No. II, the former from the Department of Agriculture and the latter from the Department of Commerce.

living. It seems to me that these are perilous times, not only because we must prepare to defend ourselves against external aggressors, but also because we may forget to keep America whole. Clean waters, green fields and forests, fertile soils, an abundance of wild things, and freedom to use and enjoy these resources properly—these I hope Americans will always have.”

With “an abundance of wild things” as its specific major objective, the Fish and Wildlife Service has been making strenuous efforts to insure these very hopes. Its efforts have been exerted in two ways: (1) By cooperating with every means at its command in the national defense program and (2) by taking every apparent precaution to safeguard the Nation’s fish and wildlife resources against needless damage.

Cooperating in National Defense

Contributions to the defense program that are peculiar to this Service have seemed of greatest importance in connection with the maintenance of morale. It has been pointed out that making a country worth living in is a first essential in inspiring zealous defense, and that an abundant wildlife is one American requirement for worthwhile living. Furthermore, a wildlife abundance is not only a source of national pride but also of national well-being. Especially during strenuous times it is important to provide for the relief and the tonic benefits that can come from outdoor recreation. Wise administration of our wildlife resources will help maintain our avenues to serenity.

Yet there are also more tangible contributions. The market value of the commercial fishes, for example, is indicated by a survey showing that in 1939 the fishermen of the United States and Alaska took 4,443,000,000 pounds of fishery products valued at \$96,500,000. More than 160 species or groups of species contributed to this catch, but 11 of these accounted for 80 percent of the volume and 21 made up 80 percent of the value.

So important is this source of food regarded that members of this Service have been appointed to committees of the National Defense Advisory Commission and of the Office of the Administrator of Export Control. They have also contributed extensively in furnishing inventories of fishery commodities, assisting in drawing specifications for fishery products, and supplying information on fish cookery and nutritive values of fishery commodities, charts of seasonal abundance, information on geographical distribution, price ranges, and other data useful to military purchasing agencies and Federal food-planning organizations.

Estimates of the possibilities for increasing this food supply led to

the conclusion that a 46-percent increase could be realized over a period of years and that under conditions of wartime emergency the yield could be increased to 4,628,000,000 pounds almost immediately and to 6,200,000,000 after a few years. Recommendations to the industry were formulated for carrying this out to a considerable extent, without materially increasing the capital outlay or cost of operation.

The Nation's food supply is safeguarded in another way by this Service's cooperative work in controlling predatory animals and destructive rodents. Protection was afforded livestock, poultry, and game during the year by the taking of 122,941 predatory animals in cooperative control work, thus providing additional safeguards to wool and meat supplies. Cultivated crops, timber, and forage resources, irrigation and soil-conserving structures, and stored food and feed supplies were protected from rodent damage through the treatment, under the Service's supervision or general direction, of 25,321,902 acres of rodent-infested lands and 104,267 rat-infested premises.

In connection with the rodent-control work, an acute shortage of high-grade red squill, an important raticide, was noted as a result of the international situation, which has cut this country off from the source of supply in the Mediterranean. To meet this problem, scientists of the Service have developed a method for the practical fortification of low-grade squill and, in cooperation with the Bureau of Plant Industry of the Department of Agriculture, have taken steps to determine whether squill may be satisfactorily grown in the United States. Rat control is always necessary in connection with military operations, especially at camps and ports of entry, and special efforts are being made at this time to insure successful control.

The defense advantages of other Service activities have also been emphasized, and in all possible ways the Service has cooperated in the national program. Law-enforcement personnel, refuge managers, professional hunters and trappers, and highly trained and experienced technicians—all are potential factors in national defense. The Service's employees are familiar with the details of the country's terrain and are able to adjust themselves readily to emergencies in mountains, forested areas, and marshes and on the water. The work of the Civilian Conservation Corps in 36 camps on national wildlife refuges has included the construction and repair of roads, bridges, fences, telephone lines, dams, dikes, and lookout towers and the operation of more than 1,100 trucks and other heavy equipment—all of practical value in preparing the enrollees for possible emergencies. Parts of several refuges were turned over to the War Department for use as emergency landing fields, bombing and gunnery ranges, and for other purposes during the emergency period.

Emergency Defense of Wildlife

Alert to see that every conceivable wildlife contribution is made to the national defense program, the Fish and Wildlife Service has also been vigilant to prevent needless damage to the resource during the emergency and to forestall exploitation that may be disguised as defense.

It is recognized that there are always forces and interests ready to take advantage of any program that promises to divert attention from their own selfish activities. The danger to wildlife from such sources during the present emergency has been publicized by the Service in press statements, radio broadcasts, and addresses at conventions. It has been pointed out that by being watchful, conservationists can prevent those actions disguised as defense but actually designed to promote personal gain at the expense of natural resources. The result of this publicity, and of similar efforts by others, has stimulated an interest on the part of conservationists that is proving effective.

Misdirected zeal and inadequate forethought would result in unnecessary damage to wildlife by activities that are actually essential to defense. The mistakes of the last war still linger in memory—mistakes that, for example, included overfishing to the extent that years have been required to remedy the situation. It is fitting, of course, that wildlife should be subordinated to the defense needs of the Nation, but no emergency is great enough to warrant the destruction of the fisheries or cause irreparable damage to other wildlife on which the Nation's welfare depends. Some impairment of these resources, it is recognized, may be unavoidable on areas being used for bombing ranges, military reservations, and defense industries—to mention another example of emergency situations—but if biologists can recommend courses of action that will result in the use of areas relatively unimportant to fish and wildlife, it will be possible so to conduct defense activities as to minimize the losses.

Such representations have received the support of conservationists throughout the country, and the necessity for precautions has been emphasized by the President and other leaders. This Service has been actively vigilant, and it is trusted that the mistakes of the last World War will not be repeated.

The most definite action taken followed a request by the President that a liaison officer from the Fish and Wildlife Service be designated to keep informed of the activities of defense agencies that affect fish or wildlife. This officer was appointed and instructed to report to the Secretary of the Interior any such activities that would seem damaging to this resource. The results so far have been excellent. Not only has the liaison been beneficial in connection with the emergency activities, but also it is probable that the resulting contacts will bring

about the development of standard policies so that wildlife at all times will receive greater consideration in connection with plans for water impoundments and other engineering operations.

The year's events thus give excellent hopes for the protection of wildlife from needless exploitations in the fast-moving defense programs.

Organizing a New Agency

Aside from the exigencies of national defense, the year's most important distinctive activities have been those connected with effective organization. Entering the year as a new agency, the Service has had to carry on and coordinate the activities of two formerly separate bureaus that had both been functioning for more than half a century. While gratifying progress can be reported in the integration and consolidation of the new Service's many and diversified activities, the work of organization is continuing. No drastic changes have been found necessary, but rather it has seemed both advisable and desirable that organization should evolve gradually as the interrelationships and requirements of the work become apparent through experience. A consolidated administrative division was established from the separate units of the former bureaus, and public-relations work was consolidated in one division, but the operating divisions of the two agencies have been continued with few readjustments other than combining all law-enforcement activities in one unit. The activities of these divisions have been effectively coordinated, however, in so many instances that the advantages of the consolidated Service are being constantly realized.

At the close of the year the major functional and regional activities were delegated to the following organization:

Director.....	Ira N. Gabrielson.
Assistant Director.....	W. C. Henderson.
Assistant Director.....	Charles E. Jackson.
Technical Adviser.....	W. L. McAtee.
Chief Counsel.....	Donald J. Chaney.
Chiefs of Divisions:	
Administration.....	W. R. Dillon.
Public Relations.....	H. P. Sheldon.
Fishery Biology.....	Elmer Higgins.
Wildlife Research.....	W. B. Bell.
Wildlife Refuges.....	J. Clark Salyer, II.
Land Acquisition.....	Rudolph Dieffenbach.
Construction and CCC Operations.....	Hugh W. Terhune.
Federal Aid in Wildlife Restoration.....	Albert M. Day.
Fish Culture.....	Glen C. Leach.
Predator and Rodent Control.....	Dorr D. Green.
Fishery Industries.....	R. H. Fiedler.
Game Management.....	W. E. Crouch.
Alaska Fisheries.....	Ward T. Bower.

Regional directors and headquarters:

Region 1 (Western): Portland, Oreg.....	Leo L. Laythe.
Region 2 (Southwestern): Albuquerque, N. Mex..	John C. Gatlin.
Region 3 (North Central): Minneapolis, Minn...	Burnie Maurek.
Region 4 (Southeastern): Atlanta, Ga.....	James Silver.
Region 5 (Northeastern): Boston, Mass.....	S. Barry Locke.

Other Events of the Year

The Fish and Wildlife Service is both a research and an action agency. In administering laws, national wildlife refuges, fish hatcheries, predator and rodent control, and other operations, it depends on the results of fact-finding work carried on by its staff of scientists and statisticians. The factual resources of other institutions also are drawn upon, and the results of the Service's investigations are made generally available through its information services.

The outstanding events in the year's work not already referred to may be summarized as follows:

Finding the Facts

Threat to haddock supply.—Investigations to safeguard the future of the North Atlantic haddock fishery showed that avoiding the capture of small and sexually immature fish will allow an additional year or two of growth and spawning and thus increase the annual yield by at least 100,000,000 pounds and the fishermen's earnings by \$4,000,000.

Races of shad.—Application of shad conservation measures was simplified by examinations of scales, which disclosed local races of shad along the Atlantic coast, each having a different growth history.

Oyster pest control.—Control of starfish by oyster farmers at a minimum of effort and expense was facilitated by the issuance of weekly bulletins giving the location, abundance, and time of "setting" of these widespread predators on oysters in New England.

Carbon dioxide a fish anesthetic.—In experiments in the Pacific Northwest carbon dioxide proved to be a successful anesthetic for preventing injury to large fishes during truck transfer and spawning operations, without detriment either to the fishes or their sexual products.

Fishery mission to Mexico.—On invitation of the Mexican Government and under congressional authorization two aquatic biologists visited Mexico to assist in the exploration of the commercial fisheries, in a study of inland angling conditions, and in the improvement of hatchery and stocking practices.

Great Lakes fisheries.—Service investigations of the Great Lakes fisheries and public hearings held by the International Board of Inquiry disclosed overfishing and inadequate regulation to be chiefly responsible for the depletion of many species.

Continued waterfowl increase.—A continuing but small increase in most species of ducks and geese, revealed by investigations from the Arctic coast to southern Mexico, demonstrated the soundness of the principles of the waterfowl-restoration program.

Canada goose management.—Improvements in management developed by research were partly responsible for the increase from 27 to 77 percent in the number of Canada geese nesting on units of the Bear River Refuge, Utah.

Arctic waterfowl habitat.—River areas in the Arctic region were found to provide nesting sites with ample feeding grounds for all the waterfowl that are permitted to return there.

White-winged dove crisis.—Studies made in Arizona and Texas of causes of depletion of the white-winged dove, protected under treaty with Mexico, were followed by regulatory action to prevent overhunting.

Big-game estimates.—The third annual inventory revealed nearly 5,850,000 big-game animals in the United States, of which more than 5,275,000 were deer.

Status of desert bighorns.—Surveys were made in the Southwest to determine the relation of environment and population density to the welfare of desert bighorns and the action needed for improving their status.

Botulism control.—Chemical tests in potential toxin-producing areas enabled wildlife managers to cope more effectively and economically with this menace to waterfowl.

Auction of Federal furs.—Valuable data have been assembled through the recently unified policy of disposing of pelts of land fur animals by the Service, and sales at public auction netted the Government \$80,000.

Fox import quota.—With war conditions abroad preventing normal trade in many countries, a substantial increase in the Canadian quota on silver foxes was made possible.

Restoring Fish and Wildlife

New refuges.—The number of national wildlife refuges was increased to 267 and the acreage to 13,740,304 by the establishment of 4 new refuges: Havasu Lake, and Imperial, Ariz. and Calif.; San Andres, N. Mex.; and Thief Valley, Oreg.

Water impoundments on refuges.—By CCC labor, the Gamma Dam on the Wichita Refuge, Okla., the Burgentine Dam on the Aransas Refuge, Tex., and dikes on the Swan Lake Refuge, Mo., were completed.

Refuge revenue.—Deposits in the Federal treasury from sales of big game and other products of national wildlife refuges totaled \$79,676.52.

Production of fish hatcheries.—A lessened production of fish and fish eggs from Federal hatcheries resulted from limited plants of fertilized eggs of three marine species off New England, but the number of fingerlings and fry distributed from hatcheries increased.

Increased Federal aid.—The appropriation for Federal aid in wildlife restoration, \$2,500,000, was \$1,000,000 in excess of 1940, and the number of States eligible for participation was increased from 43 to 46.

Transfer of salmon runs.—Salmon runs were again successfully trapped and transferred to establish spawning grounds in streams entering the Columbia River below the Grand Coulee Dam, which is too high for the operation of fish ladders for reaching waters higher up.

Fish screens.—To curtail losses of fish in irrigation diversions, large rotary fish screens and other equipment were installed in reclamation projects in Idaho and Washington.

Improving Fishery Industries

New technological laboratories.—To expand investigations for developing and improving methods of producing, preserving, handling, and utilizing fishery commodities, new technological laboratories were established at Ketchikan, Alaska, and Mayaguez, Puerto Rico, and a new building was completed at College Park, Md.

Exploratory investigations.—In the North Pacific and in Bering Sea, information was gained on seasonal abundance of king crabs, efficiency of fishing gear, and

developments in crab canning; and in and off Peru availability of commercial fishes was investigated, procedures tested for handling and development, and the economics of marketing practices analyzed.

New fishery legislation.—Recommendations based on Service research resulted in legislation in Maryland seeking to control overfishing, by the revolutionary practice of establishing license quotas for commercial fishermen.

Enforcing Laws and Regulations

Severe penalties for illegal hunting.—Three game-law enforcement officers of the Service seized 81 ducks taken unlawfully by 6 Michigan hunters, who were fined a total of \$3,250.

Hunting regulations.—Among changes in the migratory-bird hunting regulations were the lengthening of the waterfowl season from 45 to 60 days, permitting shooting to begin at sunrise, and shortening the woodcock season 15 days.

Alaska air patrol.—Operation of airplanes by wildlife agents of the Alaska Game Commission over approximately 70,000 miles in the patrol of fur and game areas has facilitated law enforcement in the Territory.

Conserving Alaskan Resources

Fishery biological laboratory.—Completion of a well-equipped fishery biological laboratory at Little Port Walter, Alaska, with residence facilities, for the first time made year-round studies of the pink salmon possible.

Fishery-research vessel.—A new 58-foot motor vessel, the *Heron*, with full modern fishing and oceanographic equipment, was completed and commissioned for use in fishery biological investigations in Alaska.

Bald eagle investigations.—The questionable status of the bald eagle in Alaska, where the species is most common, led to a detailed study of its food habits and economic relations.

Fur seal research.—In a research review of the fur seal situation on the Pribilofs, some 5,000 seals were branded for identification in future observations and important studies were made of the ecology and management of the herd; last season 65,263 seals were taken for their fur, the largest number since the Federal Government has been managing the herd.

Disseminating Information

The new Service has continued the programs of the Biological Survey and Bureau of Fisheries for disseminating information by means of official publications, press statements, radio broadcasts, articles in magazines and journals, addresses at important gatherings, motion pictures, slides, exhibits, and photographs. The printed and processed publications of the two former bureaus were surveyed as to series and a new schedule of series established.

Under the authority of Public 393, Seventy-sixth Congress, a program to develop and increase the markets for fishery products of domestic origin was begun in Pittsburgh, Cincinnati, and Columbus. Most promising results have been attained through the activities of Service specialists who have given marketing and other technical assistance to retailers and wholesalers and have aided consumers.

Market information and educational materials were provided for housewives through radio broadcasts, newspapers, and consumer groups. To aid in purchasing fish and to assist the industry in relieving surpluses, each of the Service's market news offices, for example, has prepared scripts covering good buys, and other useful information about fish, which are broadcast about four times weekly over nearly 100 domestic radio stations.

Funds Available

To finance the work of the Service for the year, a total of \$13,433,578 was available from regular and emergency appropriations. Of this sum \$9,729,073 was provided in the Interior Department Appropriation Act; \$1,257,560 was realized from the sale of Federal migratory-waterfowl hunting stamps; \$571,439 was allocated under the Emergency Relief Appropriation Act of 1940 for Federal conservation projects in connection with conservation activities, and \$19,279 for related administrative expenses; \$1,132,519 was allocated for the CCC work program on national wildlife refuges; \$530,175 was allocated by the PWA for buildings, water-control structures, and floating equipment; \$15,000 was allocated by the Department of State for fishery cooperation with American Republics; \$25,000 was allocated by the Department of Agriculture for developing and increasing market facilities for domestic fishery products; \$53,653 was allocated by the Office of Land Utilization, chiefly for soil and moisture conservation and land-use operations; \$75,350 was allocated by the Bureau of Reclamation, \$73,000 of which was for the rehabilitation of migratory fish in the Columbia River Basin and \$2,350 for investigations of migratory-fish problems arising out of the construction of Shasta Dam; and \$24,530 of the allocation by the Bureau of Reclamation during the fiscal year 1940 for construction of a fish-cultural station at Austin, Tex., remained available. Contributions of \$26,758 were received from non-Federal cooperators for use in predator-rodent control and wildlife conservation. A commercial firm cooperating in the disposal of sealskins advanced \$73,300 for use in activities on the Pribilof Islands, Alaska, later making recovery from the proceeds of sales.

Research on Fish and Wildlife

Fishery Biological Investigations

INTERNATIONAL RELATIONS AND THE FISHERIES

Biological fishery investigations by the Service are closely associated with the scientific work of international commissions and international fishery investigations. Membership of Service officials in the various

agencies or participation in the projects aids in coordinating conservation and management of international fisheries and those of the United States and Alaska.

Management of the Pacific halibut fishery by the International Fisheries Commission proved effective in restoring the supply through attainment by fishermen of larger catch quotas in shorter fishing time. The Pacific halibut is now almost twice as abundant as in 1930, when, through uncontrolled exploitation, the lowest level was reached. Illegal activities, difficult to control, are preventing recovery of the halibut stock in one important fishing area.

The International Pacific Salmon Fisheries Commission, created in 1937 to preserve the sockeye salmon fisheries of the Fraser River system, will not assume regulatory powers until 1945, but it continued an investigational program designed to provide biological data on life history, migration, ecology, and natural abundance.

Culminating over 20 years of fishery investigations on the Great Lakes, during which time overfishing and inadequate regulation by 8 States and the Province of Ontario were found to be the principal causes of the decline of many important species, the International Board of Inquiry for the Great Lakes Fisheries was established. From October to June the Board held 29 public hearings, to obtain the views of fishermen, sportsmen, and interested citizens on questions of depletion and regulation and to accumulate other pertinent facts.

Pursuant to requests of the Republic of Mexico for assistance in developing, conserving, and rehabilitating its marine and fresh-water fishery resources, a preliminary survey was made and a comprehensive program formulated, and in April two biologists were assigned to the work.

COMMERCIAL FISHERY CONSERVATION AND MANAGEMENT

The development of principles and methods of scientific management of commercial fisheries resulted from a continuous program of biological studies designed to determine the size of existing stocks, to measure rate of fishing and annual replacement through reproduction, growth, and migration, and to devise methods of eliminating wasteful and destructive practices. Biological investigations were conducted in most of the important commercial fishing areas of the United States and Alaska, although expansion is needed to cover some localities more extensively and to begin work in others where no program is supported. As most of the commercial fisheries are under State jurisdiction, the role of the Federal Government is investigative and advisory. The Department regulates and manages the fisheries of Alaska, and international treaties offer protection to the Pacific halibut and the sockeye salmon of the Fraser River. The Alaskan fisheries

and the Pacific halibut have responded to the scientific management that has replaced unsatisfactory methods of independent legislative control. Similar results may be expected under well-coordinated management. Through long and diversified studies, overfishing and wasteful practices have been isolated as the chief causes for the decline of many of the valuable marine and fresh-water fisheries.

At a time when the efforts of the Nation are directed toward defense, it is important to realize that many of the fisheries are overexploited. They cannot be expected to provide increased quantities of food and industrial products without incurring danger of depletion except by scientific management. Estimates based upon biological and statistical research have disclosed that the annual yield of the commercial fisheries can be increased within a few years by as much as 46 percent. Management procedures would result in a moderate curtailment of catch during the first year, but an increasing yield would become possible during succeeding years until maximum productivity is attained. Temporary curtailments, however, need not impair the food supply. The diversion of greater quantities of certain species to food uses and the utilization of greater quantities of certain nonfood species would offset effectively any temporary deficit.

NORTH ATLANTIC FISHERY INVESTIGATIONS

Flounders.—Seasonal and annual trends in the catch of five economically important species of flounders were determined from an analysis of catch statistics. Local populations of the winter flounder were discovered through studies of length-frequency, racial, and age data. A seasonal spawning migration of fish over 3 years old and a slight dispersion of the stock as they grow older has been indicated by tagging experiments. An increase from 6 to 10 inches in the size limit for the winter flounder was recommended, except in western Long Island Sound and Shinnecock-Moriches Bay, in order to increase the future yield and provide a greater spawning reserve.

Groundfishes.—The distribution of the groundfish fishery according to species, seasons, areas, and depth of water was worked out from detailed records for the decade 1931–40. The lemon sole population on Georges Bank declined progressively from 1932 to 1938 but recovered partially in 1939.

Haddock.—The total strain on the haddock fishery was measured through analyses of data from various sources. Cycles of abundance occurred from 1914 to 1931, but there was a continuous low level from 1931 to 1940. The recent abundance of small haddock normally would promise good catches of large fish in subsequent years, but the increasing capture and sale of small haddock (almost 60 percent of the total 1937–40 catch) has drastically reduced the catches of large fish.

Small haddock have a low market value and are sexually immature, whereas 1 or 2 years of additional life would more than double their weight and insure a better spawning reserve. Protecting nursery grounds and stopping the capture and sale of small haddock will increase the annual catch by 100,000,000 pounds or more, which will raise the annual income of the fisherman by more than \$4,000,000, and insure the species against depletion.

Mackerel.—Studies of the 1939 populations of mackerel revealed that a partial size merger of the 1937 and 1938 spawning broods was due to the abnormal growth rate of the 1937 brood. In 1939 the availability of mackerel fell 40 percent below that in 1938, and fishing intensity continued on a downward trend. Although availability is low, the mackerel stock is in no danger since the supply is not all utilized by the fishery. Under present conditions in the fishery, protection of young mackerel to insure supplies of older fish is not necessary.

Atlantic salmon.—The almost complete extermination of the Atlantic salmon from New England waters has resulted from heavy fishing, deforestation, pollution, and obstruction of spawning streams. Natural conditions on some streams have improved recently, and it is probable that restoration will be successful. A comprehensive cooperative restoration program through surveys, artificial stocking, and management was prepared and submitted to State conservation agencies.

Lobster.—The survival of lobsters under hatchery conditions has been materially increased through rearing experiments. Conditions studied and evaluated in relation to degree of survival included water temperature, food, frequency of feeding, number of individuals per tank, and light intensity. Tagging experiments disclosed a variation in fishing intensity from 14 to 56 percent in different coastal sections and very little intermigration between lobster populations. In the Maine fishery, 90 to 95 percent of the lobsters taken are immature, leaving a very limited spawning stock. An increase in the legal minimum size would largely overcome this condition and ultimately increase the yield.

MIDDLE ATLANTIC FISHERY INVESTIGATIONS

Shad.—From tagging experiments and scale studies the rate of shad fishing in the Hudson River has been calculated at about 60 percent, and in Chesapeake Bay and North Carolina at about 90 percent. Over a 5-year period the lower rate yields as many pounds from each year-class as the higher, but the 60-percent rate permits 6 times as much spawning. Evidence from 3 lines of investigation established the racial identity of each stream population of shad. Shad tagged

in one year returned to spawn in the same stream the following year.

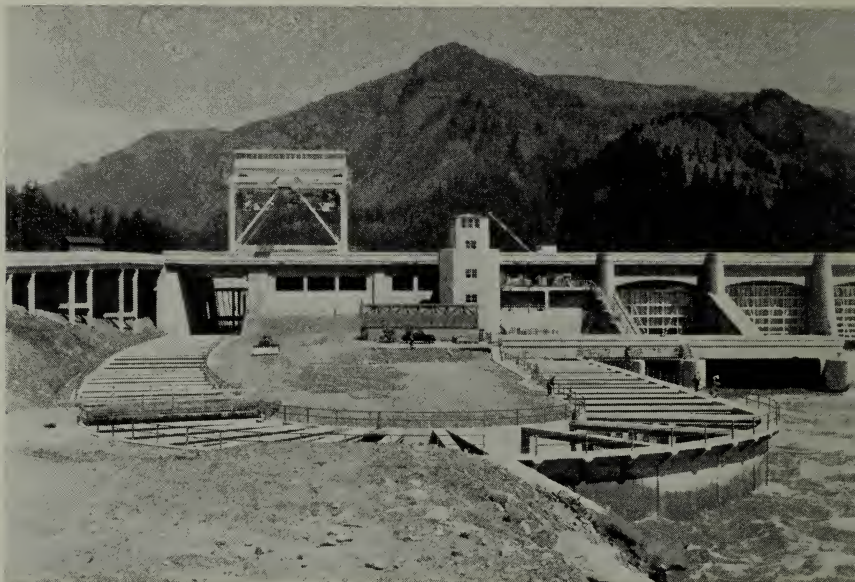
Striped bass.—Cooperative investigations of the striped bass were conducted and further evidence obtained on the effects of year-class dominance on the commercial yield. Changes in migrations from year to year may produce pronounced changes in the catch in a particular fishing area, and failure of catch in certain areas may be interpreted erroneously as signs of depletion. For example, striped bass move more or less directly from southern Massachusetts waters to the eastern and southern shores of Long Island, and in some years the route is closer inshore than in others. In 1940, when the Rhode Island catch was low, good catches were made in New York waters, indicating that the run was too far offshore to be intercepted by Rhode Island fishermen. A survey of spawning areas showed that little or no reproduction occurs in many apparently suitable localities north of Chesapeake Bay, despite the presence of sexually mature adults. Therefore, the runs of striped bass are supplied principally by the spawning areas and nursery grounds in the vicinity of Chesapeake Bay and southward. These facts indicate the need for uniform and coordinated regulation of the fishery, which has been partially achieved in some States by the adoption of a recommended minimum legal size.

SOUTH ATLANTIC AND GULF FISHERY INVESTIGATIONS

Shrimp.—The main shrimp-producing area of the United States is the Gulf of Mexico, but there are important shrimp fisheries on the Atlantic coast from North Carolina southward. Overfishing and natural causes, including adverse weather conditions, have so far depleted the spawning stock, especially on the Atlantic coast, as to cause a serious shortage of young. Population and migration studies indicate that there are no concentrations of Atlantic coast shrimp in waters beyond the 15-fathom contour. Tagging experiments established the existence of two or more general distributional areas in the Gulf of Mexico. In periods of cold winter weather in the Gulf the small shrimp migrate to the warmer waters offshore and tend to return to inshore coastal waters in spring as soon as the water temperatures rise. Recommendations to the States, based on information gained through investigations over a period of several years, should assist greatly in restoring the shrimp supply.

PACIFIC FISHERY INVESTIGATIONS

Rural and industrial expansion in the Pacific Northwest is seriously jeopardizing the survival of the salmon and migratory trout popula-



CONSERVATION SAFEGUARDS SALMON INDUSTRY

When Bonneville Dam was constructed in the Columbia River, it was feared the massive structure would disrupt the upstream migration of salmon to natural spawning grounds from whence comes the mainstay of the area's fishing industry. To meet this emergency, the bold experiment of constructing liquid ladders by which the fish may climb over the dam was undertaken by the War Department under the conservation program now being continued by one of the Fish and Wildlife Service. UPPER: General views of the fishways. LOWER: Closer view of the water steps used by salmon and other fishes to reach upper portions of the river.

tions. This is especially true in the Columbia River system, where the development of power and irrigation projects has prevented salmon and trout from entering tributary streams to spawn. Recognizing the need for evaluating the factors responsible for this decline, the Service has recommended remedial measures and methods by which these populations may be protected and rehabilitated.

Columbia River investigation.—Stream-survey activities were confined mainly to the Willamette River system, where the proposed construction of seven dams by the War Department will result in difficult problems in fish protection and salvage. To test the influence of Bonneville Dam on the survival of salmon migrants, 100,000 chinook salmon fry were marked and released above the dam at the Spring Creek hatchery. Activities in connection with the salvage of the salmon runs blocked by Grand Coulee Dam included the planting in lakes and streams, and subsequent observation, of about one-third of the total run of adult salmon and steelhead trout. The transferred salmon showed low mortality, and a satisfactory return of fry resulted from the 1939 plantings of trout and salmon—evidence of the feasibility of the program to establish salmon runs in streams that formerly had only small or no runs.

Coho salmon.—Marked differences were found in the growth and condition of fish in five key streams in the Puget Sound area, selected as sources of material for studies of the food, growth, and migration of coho salmon fry and fingerlings. As the food of fingerlings consists of 90 percent of aquatic insect larvae, stream production depends to a great extent upon the bottom fauna, the numbers of dominant species of which and the volume per unit area varied in the streams and fluctuated by season.

Pilchard.—The trend of recent years toward a preponderance of younger age-groups in the pilchard stock continued, the yield of the 1939-40 season in the three Pacific Coast States and British Columbia being 8.5 percent higher than during the previous year. This condition could result either from accelerated removal by the commercial fishery or from a series of unusually successful spawnings. The stability of the catch may reflect the restrictions on the quantity to be used for reduction purposes in California, where 92 percent of the catch was landed, rather than the condition of the resource. As the significance of changes in abundance depends upon accurate determinations of age composition of the population, a method of determining the age of pilchards up to 10 inches in length was perfected. Extensive materials have been collected, and studies were directed toward an extension of the method to larger and older fish. Variations noted in the growth rates of different year-classes point to the need of maintaining a continuous program of age determination at the important fishing ports in order to correlate abundance changes

with annual mortalities and replacements. In collaboration with the Scripps Institution of Oceanography, it was found that pilehard spawning is widespread between Mexico and British Columbia and extends 300 miles to sea, and is much more intense off southern California than elsewhere.

Sacramento River studies.—Problems associated with preserving the salmon resources of the Sacramento River, which will be affected by the construction of the Shasta Dam, were investigated for the second consecutive year in cooperation with the Bureau of Reclamation. A second and more detailed survey of spawning areas resulted in the conclusion that salmon do not spawn in the Sacramento proper as thickly as in its tributaries. Since the dam will prevent salmon from reaching important tributaries, it now appears that available spawning areas in the main river are inadequate to accommodate the fall run and that reliance on transfer of runs to other streams and artificial propagation will be necessary. Weirs and a salmon-counting station have been designed and are to be constructed to distribute the salmon on the spawning grounds in the main river.

GREAT LAKES FISHERY INVESTIGATIONS

Noteworthy progress was made toward the solution of the increasingly important problem of the relationship between sport and commercial fisheries of the Great Lakes. In a series of meetings, in which representatives of sport and commercial-fishing interests were brought together to discuss the problems of regulation, much was accomplished to eliminate friction and to bring out forcefully the fact that regulation and management are a common concern. Progress was made on the survey of the sport and commercial fisheries of Grand Traverse Bay and Lake Superior, where sportsmen are making insistent demands that certain areas be closed to commercial fisheries. Attention was devoted primarily to the completion of research projects, and annual tabulations and analyses of commercial fishery statistics of the Great Lakes were continued in order to follow trends in abundance of the various species. These studies disclosed that the Lake Huron whitefish is in danger of extermination, primarily as a result of overfishing caused by the deep trap net.

OYSTER CULTURE AND MANAGEMENT

The keynote of the shellfish investigations is the application of precise laboratory research to field studies designed to provide practical solutions of various problems of oyster cultivation, utilization of oyster bottoms, protection against natural pests and enemies, and

oyster marketing. Because of a marked difference in ecological conditions within the range of the American oyster, some phases of the investigations are carried on simultaneously at stations in Connecticut, Massachusetts, Maryland, South Carolina, and Florida.

Propagation.—The study of sex reversal in oysters, in progress since 1936, was completed and it established definitely that the changes take place at random in both directions. The existence within an oyster population of a group with highly unstable gonads, previously suggested by incomplete analyses of data, has been disproved. Development of the ovaries is accompanied by accumulation of manganese. A decrease in the rate of metabolism after spawning provides a clue to an understanding of the process of glycogen accumulation (fattening), and facilities have been provided for conducting the study on a year-round rather than a seasonal basis.

The experimental oyster farms in South Carolina suffered considerable damage from a tropical disturbance in August. Despite the handicap, progress has been made in reinforcing oyster bottoms, establishing growing grounds, and studying the rate of growth. The first crop of oysters from one of the experimental farms was harvested and the product found superior to other oysters from the vicinity produced on natural beds without the benefit of scientific farming methods.

The lack of setting of oysters in the Rappahannock River, Va., is due primarily to the abundant development of various sedentary animals (bryozoans, sponges, and ascidians), which prevent the attachment of larvae. It was recommended that depleted natural beds be restored by planting with seed oysters.

Exploration in Maine demonstrated that a large-scale oyster industry cannot be developed there, primarily because of low temperature, high salinity, softness of bottom, and formation of ice on tidal flats. Only limited areas have been found where oyster farming on a small scale appears feasible.

Pathology.—Infection of oysters with the gregarine *Nematopsis ostrearum* was found to produce considerable disturbance in the functioning of the adductor muscle, resulting in paralysis. Infected oysters are unable to protect themselves against attacks of enemies and die when exposed to the air. Mortalities usually occur during periods of drastic environmental changes associated with weather or transplanting operations.

Oyster bulletins.—Information regarding temperature of water, time and intensity of spawning, expected time of setting, and presence of starfish and other oyster enemies was supplied regularly through weekly bulletins to the oyster industry of Long Island Sound, where almost the entire industry depends upon this information to determine the best time to plant shells and to transplant spat to prevent its destruction, as well as the best methods of combating pests.

SPORT FISH CONSERVATION AND MANAGEMENT

The economic values of sport fishing in inland and coastal waters are difficult to assess with certainty, although this form of recreation attracts more than 12,000,000 people annually. Aside from its recreational value, angling provides a considerable, although sometimes seasonal, increment to the food supply of large segments of the population. As in the commercial fisheries, however, overfishing is one of the principal causes of reduction in abundance of game fishes. Aquicultural investigations are designed to develop and carry out procedures that will assist in improving and maintaining the angling resources through natural and artificial propagation, stocking, and management.

Trout.—Studies designed to test different stocking and management measures indicate rather startlingly that factors often disregarded are related to the survival of artificially stocked trout. Returns to anglers of only 2.4 percent from planting fingerlings for several successive years in St. Mary River, Va., led to the conclusion that such stocking does not materially improve angling in this and similar streams. The futility of planting large trout in fall was demonstrated in the Pisgah National Forest, N. C., where, despite the introduction of 18,135 trout over 6 inches long during several successive years, only 795, or 4.4 percent, have been taken by anglers. That planting in unsuitable waters is apt to be fruitless was illustrated in Convict Creek, Calif., where planting equal numbers of brown and rainbow trouts resulted in subsequent catches of only 32 brown and 15,834 rainbow trouts. Rainbow trout conditioned for several months in a seminatural environment were not caught so easily in Virginia as those reared under ordinary hatchery conditions. In California, satisfactory survival resulted from plantings of 4- to 5-inch trout and from eyed eggs when predation by other species was at a low level, but plantings of newly hatched fry yielded poor results.

Black basses.—Artificial culture of pondfishes is of great importance, especially in the Central and Southern States, where angling is intense and natural propagation insufficient. The creel census has become an efficient method of evaluating the results of stocking. Such a study indicated that surprisingly small catches, 2.78 and 0.69 small-mouth black bass per acre, respectively, were obtained in the South Branch of the Potomac and on the Cacapon River. The total catch of all species averaged 7.22 per acre in the Potomac and 8.43 per acre in the Cacapon. Experiments in Florida demonstrated the advisability of stocking nursery ponds with largemouth black bass of uniform size. When individual ponds were stocked with fry of assorted sizes, competition affected growth and survival, and the

production per unit area was smaller than in ponds stocked with graded sizes.

Management of intermountain lakes.—Mountain lakes of the West are usually noted for fish productivity, and until the establishment of national parks and recreational areas and the consequent building of good roads, their fishery resources were little exploited. Work on improving and managing such waters was limited primarily to two important lakes. The low fundamental productivity of Bear Lake, in Utah and Idaho, and other conditions unfavorable for the maintenance of a large trout population require that fishing be carefully regulated. Under the management program adopted for a reduction of the undesirable population of chubs in Fish Lake, Utah, good results were obtained, without, however, a hoped-for increase in the brook trout. The continued decrease in the numbers and size of both brook and rainbow trouts may be partly due to excessive artificial stocking, with resultant competition for food.

FISH PARASITES AND DISEASES

Advances in the field of fish pathology included the isolation of a new species of fungus, *Saprolegnia invaderis*, that infects small fingerling trout. Its growth begins in the digestive tract, whence it penetrates into the abdominal cavity and then proceeds to the outside through the body wall, causing death. A new species of *Costia* was found to be the cause of considerable mortality among trout fingerlings. The causative organism of ulcer disease was isolated, and typical lesions were produced by inoculating healthy fish with pure cultures. Mortality among brood stocks of black bass held over winter was found to be due to infection with *Proteus hydrophilus*. This same organism, believed to be the cause of the pathological condition in frogs known as "red legs," has not been reported previously as affecting fishes. Another important discovery was that bacterial gill disease, frequently found in hatchery trout, may cause mortality in black basses.

WATER-QUALITY STUDIES

Diversified investigations of water quality, designed to solve specific problems and define biochemical and physiological standards for aquatic life, were conducted in mobile and permanent laboratories. Included are studies of pollution by domestic sewage, discharges of soluble and suspended industrial wastes, erosion, artificial silting, and other factors that are associated closely with problems of preserving commercial fisheries and angling resources and maintaining the productivity of oyster bottoms. The wealth of information gradually

accumulated has established the distinctness of pollution criteria for public health and for aquatic life and is aiding the development of safe procedures for the effective control of fish mortality and impaired water productivity.

The Service is cooperating with other national defense organizations by conducting studies and recommending pollution-control measures in relation to new and expanding industries and the construction of military and naval establishments. The indispensable portion of the national food supply and stocks of byproducts derived from the fisheries are thus being assured increased protection from losses due to pollution.

Completed projects included a long-time study of the effects of arsenicals upon fresh-water fishes, which has a direct relationship to mosquito-control measures as well as to certain manufacturing processes and their resultant wastes; and a pollution survey of the Ohio River, conducted in cooperation with the Public Health Service and involving both field work and extensive bio-assays.

At two permanent laboratories extensive tests were conducted of pollutant and silt samples collected by field units, considering the effects of a large number of metals, compounds, and their decomposition products on various species of fishes. Studies were continued of pulp-mill pollution, which remains a difficult problem because of the diversity of processes employed and the differing nature of the woods used, and progress was made in the field of pollution by beet-sugar wastes.

Extensive physiological and biochemical studies of migratory fishes at Rock Island Dam, on the Columbia River, were continued and have an important relationship to the salvage operations necessitated by the construction of Grand Coulee Dam. The marked changes in the nature and content of the water of the Columbia have been followed, through continuous studies dating from the initial stages of dam construction. The fishery problems of impounded waters received further consideration at Grand River Dam in Oklahoma and in other localities. Beaver dams in North Dakota have produced changes in the nature and fauna of certain waters, which, according to studies in progress, show differences from the effects of beaver dams in other States where investigations have been made.

STRUCTURES FOR FISH PROTECTION

Protecting fish from loss in irrigation diversions and from injury in power house machinery and enabling them to pass over stream obstructions necessitates the design, installation, and maintenance of screens, fish ladders, weirs, and other structures. Many applications for licenses to construct water-utilization projects received by the

Federal Power Commission are submitted to the Service each year for inspection and recommendation as to special structures and modifications of design necessary to preserve the fisheries.

A diversion dam was completed on the Sandy River, in Oregon, to provide better stream conditions for migrating salmon and trout. Large rotary fish screens were constructed in the Wapeto and Prosser reclamation projects, in Washington, and at the entrance of a diversion from the Black Canyon Reservoir, in Idaho. Weirs, traps, and other structures were designed, in cooperation with the Bureau of Reclamation, for installation in the Sacramento River, in California, in connection with the Central Valley project.

Waterfowl and Other Migratory Birds

Investigations were continued of the status of migratory game birds for effective administration of this valuable resource. In times of national emergency, outdoor recreation adds greatly to the resourcefulness and stamina of the people, but to spread hunting opportunities so as to benefit the greatest number requires that the necessary regulatory measures be based upon careful research. Adequate regulation even in a period of emergency is also a safeguard against irrevocable harm to a resource that, properly administered, is renewable on an annual basis.

The Waterfowl Situation

The waterfowl inventory of January 1940 indicated that the continental population of ducks and geese was about 65,000,000, or nearly 2½ times the estimate in 1935. Reports on the spring migration continued to reflect a satisfactory condition, although the number of observers reporting an increase was 12 percent less than in 1939.

Investigations in Canada.—The biologists of the Pacific, Mississippi, and Atlantic Flyways resumed their studies in British Columbia, the Northwest Territories, the Maritime Provinces, Ontario, and Quebec, while work in the Prairie Provinces was continued through assignment of a biologist from the Washington office. Additional investigations in the Mississippi Flyway included exhaustive studies of the waterfowl food plants in the deltas of the Mackenzie and Athabasca Rivers.

Investigations indicate that the northern pike was not responsible for serious destruction of ducklings. In New Brunswick, Nova Scotia, and Prince Edward Island, climatic and other conditions were satisfactory and ducks again showed an increase. The biologist of the Atlantic Flyway accompanied the Chief Federal Migratory

Bird Officer for Quebec and Ontario to the James Bay region, where in one of the most important waterfowl areas in eastern Canada they made extensive studies of habitat conditions and the toll taken by Indians, who depend upon these birds for part of their winter food. As a direct result of this expedition, the Canadian Government set aside two-thirds of Akimiski Island, or about 600 square miles, as the largest bird sanctuary in Canada.

Investigations in Mexico.—Resuming investigations in western Mexico, the biologist of the Pacific Flyway found waters abnormally low and some previously important waterfowl areas entirely dry. There was a marked decrease in the waterfowl population of the Mexican tableland as a whole, but an increased number was known to have wintered in California. On the eastern coast the biologist of the Central Flyway reported aerial surveys over the waters of the Laguna Madre and the Laguna Tamiahua, where he noted a marked decrease in the number of ducks. The shortage of redheads was again cause for concern.

Investigations in the United States.—Conditions were generally favorable throughout most of the waterfowl breeding areas in the United States; but in Nebraska, marshes impaired by drought supported a decreased number of nesting birds. While the surface run off in the Great Plains was not so great as last year, marshes on most national wildlife refuges were in excellent condition and the crop of ducklings produced equaled or exceeded that of 1939.

The fall migration was characterized by a long period of mild weather, followed in the Northern States east of the Rockies by a disastrous Armistice Day blizzard. In the analysis of reports on the status of ducks and geese, the percentage of those reporting an increase dropped from 55 in 1939 to 52 in 1940, and that of those noting a decrease from 31 in 1939 to 26 in 1940. The difference was absorbed in the "no change" classification, which rose from 14 percent in 1939 to 22 percent in 1940.

The January inventory.—Excellent cooperation was obtained in the seventh consecutive January inventory from many Federal, State, and private agencies, including aircraft supplied by the Army, Navy, and Coast Guard and a commercial tire and rubber company. A heavy kill resulted from liberalized hunting regulations. Because of a scarcity of waterfowl in Mexico it appeared certain that almost the entire continental waterfowl population was concentrated in the United States. Estimates based on reports on this operation revealed about 70,000,000 ducks and geese on the North American Continent, an increase of only 5,000,000 over last year. This is the smallest increase to be recorded since the beginning of the restoration program and suggested that the shooting-season harvest came perilously close to the entire crop.

Other Migratory Game Birds

Continuous studies of the status of the woodcock indicate that its numerical strength is still insufficient to meet the demands of sportsmen; an intensive investigation on wintering grounds in Louisiana failed to disclose any important concentration, and the numbers on breeding grounds in Pennsylvania, Maine, Wisconsin, and the Maritime Provinces also were below par. A fear that the Wilson's snipe also was suffering progressive reduction was confirmed by the year's studies.

A severe storm in January 1940 took a heavier toll of mourning doves in the Southeast than was at first thought, and careful studies at various points, correlated with reports from other observers, show this species to be in a critical condition. Investigation of the status of the white-winged dove in the Southwest and at points in eastern and western Mexico showed that while the heaviest concentrations are in the United States, these are steadily declining.

Banding Game and Other Birds

By a revision of policy, the banding of migratory waterfowl is now restricted largely to the personnel of Federal and State refuges. Some municipal and private refuges are excepted, but a prerequisite for such consideration is that the entire area be a refuge on which no shooting is permitted. This has resulted in termination of the work at some cooperative stations, where for many years large numbers of ducks were banded. The total number of waterfowl banded was about 80,000; about 14,000 less than in 1940 (table 1).

TABLE 1.—Waterfowl banded during the fiscal years 1940 and 1941

Species	1940	1941	Species	1940	1941
American merganser.....	12	118	Canvasback:		
Red-breasted merganser.....	4	2	Wild.....	707	732
Hooded merganser.....	12	6	Hand-reared.....		30
Mallards:			Greater scaup.....	27	19
Wild.....	37,969	24,540	Lesser scaup.....	1,958	7,938
Hand-reared.....	2,077	2,622	Ring-necked duck.....	4,560	4,383
Black, cross.....	19	35	American goldeneye.....	8	14
Black duck:			Barrow's goldeneye.....		1
Wild.....	9,889	9,226	Bufflehead.....	6	24
Hand-reared.....	98	102	Old squaw.....	4	
Florida duck.....	27	80	Harlequin duck.....	3	
Gadwall.....	505	328	American eider.....	1	
Baldpate.....	2,328	1,408	Pacific eider.....		7
Green-winged teal.....	4,524	3,999	King eider.....		1
Blue-winged teal.....	3,553	5,747	White-winged scoter.....	1	49
Cinnamon teal.....	188	129	Ruddy duck.....	69	45
Shoveler.....	714	746	Snow goose.....	12	92
Pintail:			Blue goose.....	92	166
Wild.....	21,419	15,105	White-fronted goose.....	52	9
Hand-reared.....	87	51	Canada goose:		
Wood duck:			Wild.....	1,815	1,352
Wild.....	686	703	Hand-reared.....	116	41
Hand-reared.....		26	Fulvous tree duck.....	1	15
Redhead:			Whistling swan.....	1	7
Wild.....	557	292			
Hand-reared.....		72	Total.....	94,101	80,262

Frequent reports of a general shortage of song and insectivorous birds, particularly east of the Rocky Mountains, are partly accounted for by heavy losses from severe climatic disturbances, such as a January storm in the Southeast and the Armistice Day blizzard. Such factors do not, however, explain shortages among species that regularly winter south of the United States. Nevertheless, the 1,796 cooperators reported the banding of only 356,791 birds of all kinds, which is about 71,400 less than the number reported last year. That many active cooperators are now in military service, or actively engaged in other defense activities, has had the effect of curtailing banding work. Banding stations now operated on 23 Federal and other refuges will replace volunteer stations formerly in operation.

The five species banded in largest numbers were the chimney swift, 41,269; mallard, 27,152; common tern, 21,807; pintail, 15,105; and junco, 13,150. Five species added to the list of banded birds were the king eider, Franklin's grouse, fork-tailed petrel, purple sandpiper, and European goldfinch. Returns and recoveries totaling 32,495 brought the grand total of these records to more than 267,000.

Distribution and Migration Records

Distribution and migration reports on American birds were received from 225 observers. Additions to the files included 41,730 individual observations, together with 1,215 locality and 860 bibliographic references. This file now contains nearly 2,200,000 records, and is the largest collection of such data in existence.

Wildlife Surveys and Management

Wildlife Relationships to Forest and Range

An effort to solve the problem of winter protective use of large areas in the Lake States by wildlife prompted an experiment in 1936 to plant "lanes" and "islands" of evergreen in deciduous stands. To assist foresters in natural reseeding of burned and cut-over lands, suggestions were made to reduce the animal pressure. At the Patuxent Research Refuge, Md., a master plan was approved for a long-time wildlife-research program. Land-use plans were drawn up for studying wildlife requirements and relationships to agriculture and forestry. In the 11 Western Range States, all research workers on forest and range wildlife problems were united into one field force, and attention was directed to management problems. Predator studies show that no single species exerts any significant effect on rodent populations at the San Joaquin Range Experimental Station, Calif., but that the combined impact of raptors, carnivores, and reptiles could

readily destroy half the annual ground squirrel increase. Cooperation with the Forest Service, Grazing Service, and Soil Conservation Service was closely maintained.

In the Intermountain region, studies are under way to measure the effects of rodents on range and develop methods of balancing deer herds with forage production. Research has been initiated in the northern Rocky Mountain region to study wildlife in relation to white and yellow pine production, rodents in relation to mountain range, and game problems. A biologist was stationed at the Santa Rita Experimental Range, Ariz., for an investigation of southwestern ranges. A report has been completed on the effect of pocket gophers on mountain meadows in Ochoco National Forest, Oreg. Tests were carried out for the purpose of making Douglas fir seed unattractive to mice.

Cooperative Wildlife Management Research

Important developments in the field of wildlife-management research included the completion of 25 major projects and giving specialized training to 56 graduate students at the 10 wildlife-research units conducted cooperatively by land-grant colleges, the State game and conservation commissions, the American Wildlife Institute, and the Fish and Wildlife Service. A few highlights from each of the units follow:

Oregon.—A practical management program was developed for the major game and fur species in Oregon, and a report completed on the life history and management of the American antelope.

Utah.—Important information on the comparison of range forage requirements of big game and livestock has been prepared for publication. Research work was completed on the life history of the Rocky Mountain mule deer and beaver populations of Utah streams, and an analysis made of deer removal records from Logan River drainage. A brief summary of the findings on Utah big-game feeding habits follows:

TABLE 2.—Summary of findings on big-game feeding in Utah

Species	Number	Percentage of total volume		
		Browse	Grass	Forbs
Mule deer.....	152	94.14	3.25	2.61
Elk.....	35	59.62	34.63	5.75
Antelope.....	22	57.45	15.50	27.05
Bighorn sheep.....	1	2.00	98.00	Trace
Buffalo.....	7	8.00	90.00	2.00

Texas.—Wildlife studies of certain counties of eastern Texas were completed and a report was prepared for publication. Deer-census techniques were developed and deer-cattle relationships determined on the Aransas National Wildlife Refuge. Agricultural experiment station publications were issued on the gray squirrel and pocket gophers of Texas.

Iowa.—Nesting success of ring-necked pheasants dropped from 37.5 percent in 1939 to 25.4 percent in 1940. The lower rate of success was attributed to increased predation in which crows were the chief offenders. Renesting attempts were subjected to greater hazards of haying and harvesting. Muskrat studies on the Mississippi River bottoms showed the chief factors limiting populations were food shortages and water fluctuations. Suggestions were made on the management of mourning doves.

Missouri.—In a final report on adaptability of the chukar partridge to Missouri conditions, recommendations included the use of other subspecies from Asiatic habitats similar to those in the State. Studies on white-tailed deer showed the favored foods to be smooth sumac, coralberry, blueberry, and wild rose. Hybrid game-farm-reared wild turkeys began early breeding and suffered higher nest mortality up to April 15 from spring forest fires than did native birds. Studies were completed on the relation of rodents in field borders to agriculture and wild-life production and on the populations and quantities of aquatic foods in the Lake of the Ozarks.

Alabama.—Detailed examination of 640 red and gray fox stomachs and den collections indicated that gray foxes feed principally upon rabbits, insects, and fruits, while their red cousins augment this diet with poultry. Field work on the mourning dove project was completed and several reports were published. A determination was made of the food requirements of the wild turkey.

Ohio.—The pheasant research project was completed and a report submitted for publication together with one on the life history and management of the fox squirrel. Progress was made on studies on rabbit ecology and on fox populations. Two wildlife-management and demonstration areas were established on the university farms.

Pennsylvania.—Several projects were completed on ring-necked pheasant studies as well as research on the nutritive value of mast foods, and a report was issued on the digestive capacities of white-tailed deer. A 5,000-acre tract in Huntingdon County and 3,000 acres on the college farms for farm game were set aside for management-demonstration purposes. Studies were continued on several other important projects.

Maine.—Completion of a report on the ecology and management of the American woodcock brings this project to a close. Data reveal that some 250,000 woodcocks are taken legally each year by hunters in the United States and Canada. Studies on the life history and artificial propagation of the snowshoe hare have been completed for publication. The efficiency of deer repellents was studied and will result in less use of unreliable products. New studies undertaken include factors limiting muskrats, relation of small mammals to cedar production, a wildlife-management plan for Baxter State Park (Mount Katahdin), and the winter behavior of deer.

Virginia.—A 6-year wild turkey study was completed, and investigations of the bobwhite quail and of the gray squirrel have yielded important data.

Biological Investigations of Wildlife Refuges

Studies of forage conditions on the Wichita Mountains Wildlife Refuge, Okla., have progressed far enough to determine changes made during the third year of elimination of permitted livestock grazing. Unusually heavy rainfall during the spring increased the growth of prairie-type long grass. Three control areas of about 125 acres

each were partly enclosed by big-game fencing, for use in qualitative and quantitative research on grazing.

Studies were continued on range requirements of the antelope on the Charles Sheldon Antelope Refuge and Range, Nev., and on the Hart Mountain Antelope Refuge, Oreg. On the Sheldon Range the study was made in cooperation with the Grazing Service.

A preliminary biological survey was made of some of the major areas inhabited by desert bighorn sheep in the Southwest, and definite recommendations were made as to certain phases of management for this endangered species.

State Faunal Surveys

One of the outstanding features of the year was the completion of a lengthy report on the birds of Texas. About three-fourths of the kinds of birds that occur in the United States are found in that State.

Investigations have continued on the life zones and mammals of Washington, and a reassignment of work has made it possible again to take up the study of the birds of that State.

A report on the history, natural history, and economic relations of North American wolves was completed; one on the taxonomy and distribution of these carnivores is being written; one on the classification and distribution of the raccoons is ready for publication; and work has progressed on the white-tailed deer research.

Following surveys, an estimate was made showing 5,844,718 big-game animals in the United States in 1939.

Knowledge of the species of wildlife and their distribution is essential not only as a basis for management research, but also for efficient administration, and is based on the study collections of mammals, birds, and other vertebrates. Recording and carding information on collections, reports, and publications has been kept up to date. Additions to the mammal collection included 899 specimens, 1,223 were identified for 33 institutions and individuals in 27 States, 153 were borrowed for study from 11 institutions in 7 States, and 654 were loaned to 15 institutions and individuals in 13 States and 1 foreign country. Bird specimens to the number of 1,000 were added to the collection, 958 were identified for 37 institutions and individuals in 23 States and 2 foreign countries, and 266 were loaned to 9 institutions in 7 States.

Service biologists described 4 new mammals belonging to the genera *Dipodomys*, *Geomys*, and *Reithrodontomys*. Type specimens in the mammal collection now number 1,327. The mammal laboratories were utilized by 139 research workers other than Service employees from 30 States and 1 foreign country.

Economic Investigations on Wildlife

Waterfowl-Nesting Studies

A method of counting nesting ducks on the Bear River Refuge, Utah, was developed. An important factor limiting production of waterfowl on the Malheur Refuge, Oreg., was found to be predation by coyotes and ravens. Studies indicate that grazing on this refuge should be stopped by March 1 so that water levels can be made favorable for waterfowl nesting, and that mowing activities should be delayed until after the middle of July in order to give adequate protection to nesting birds. On Crescent Lake Refuge, Nebr., a 3-year study of waterfowl nest-mortality factors was completed. During the period bull snakes destroyed 41 percent of the 536 nests recorded, despite the fact that rather persistent control was practiced.

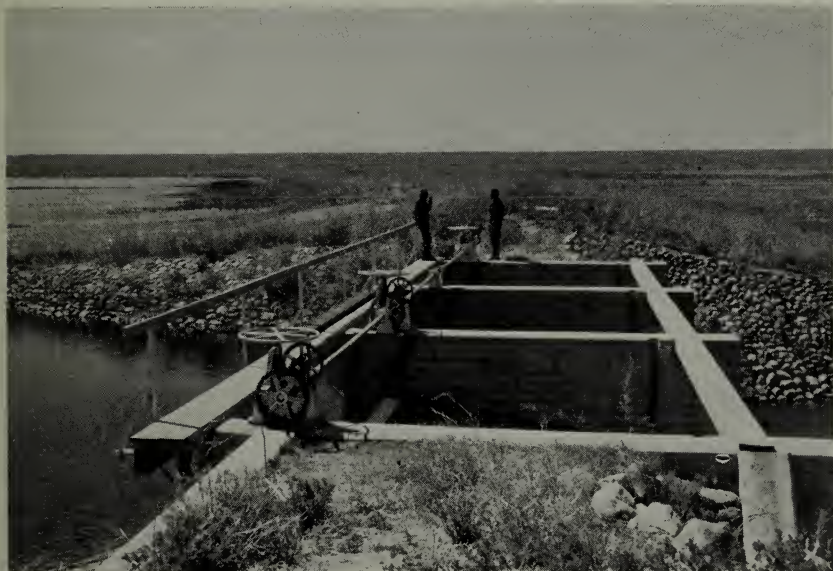
Marsh Ecology and Management

Investigations on the Bear River Refuge, Utah, showed that water distribution, location of the water table, and land elevations were the principal factors influencing the growth and distribution of marsh plants. At the Malheur Refuge, Oreg., the desirability of opening up dense stands of vegetation to meet requirements of breeding waterfowl was demonstrated.

Observations on ecology of the Gulf coast marshes were continued, particularly studies of the effects of muskrats and geese on the marsh, relation of storms to pond formation, and vegetative survival in floods. Marsh burning, now regularly practiced on the Sabine and Lacassine Refuges, La., in accordance with research findings, has resulted in the use of these areas by greatly increased numbers of waterfowl and shorebirds, especially blue and snow geese. Heavy grazing of some marsh types is found indispensable to the management of blue, snow, white-fronted, and Canada geese on Louisiana refuges.

Reconnaissance of Refuges and Refuge Sites

Important reconnaissance work was done in an effort to salvage for wildlife some of the vast tracts of land that will be damaged by construction of the Santee-Cooper Navigation and Hydroelectric Project in South Carolina. The area is one of the most important habitats in the Southeast for wild turkeys, waterfowl, and many other forms of wildlife. At the request of the State Game Commission of Tennessee the Reelfoot Lake area was investigated as a basis for setting up an effective management program. An act was passed by the State legislature on February 11, 1941, authorizing the conveyance or lease of Reelfoot Lake and the State property adjacent thereto to



AREAS RESTORED FOR WILDLIFE

UPPER: More than 150,000 young ducks have been produced on the Lower Souris National Wildlife Refuge, N. Dak., since the restoration of its marshes under the conservation policies of the Fish and Wildlife Service. LOWER: The water control gate and earthfill dam constructed by the Service to create the marshlands so important to preservation of the Nation's wild-fowl population

the United States Government. Numerous refuges and refuge sites were inspected and recommendations made for their management or development.

Canada Goose and Redhead Duck Management

Management investigations on Canada geese breeding in Utah, Oregon, and California brought to light much new information on factors influencing population increases. Of 1,826 young Canada geese banded on the Bear River Refuge, Utah, since 1937, 99 percent of the returns were from within the State. Of 327 nests on which the fate of eggs was traced, 1,267 eggs (76 percent) hatched. Losses were due to flooding, desertion, predators, cattle, and sterility.

Investigations of redhead duck requirements in Utah and Oregon breeding areas show the need for increased acreages of marshes of hardstem bulrush (*Scirpus acutus*) and other emergents having similar qualities. The importance of the principal river systems and adjacent reservoirs in the migrations of redheads was shown.

Arctic Waterfowl Habitats

Studies during the summer of 1940 of representative sections of waterfowl habitats of the far North, including the flats of the Yukon, Porcupine, and Old Crow Rivers and the deltas of the Mackenzie and Athabasca, showed that the most productive habitats are associated with the rivers that not only originate waterfowl habitats but also maintain and replenish them against encroachment by natural factors. Investigators report that as long as these rivers flow there will be ample nesting and feeding grounds in the Arctic for as many ducks and geese as the United States can send back.

Suppression of Waterchestnut

In cooperation with the United States Engineer Office of the War Department and the National Park Service, efforts to suppress waterchestnut in the Potomac River were continued, and partial removal on approximately 700 acres of watercaltrop beds was effected. Not only is the plant a serious menace to important waterfowl feeding grounds, but it is also an obstacle to boating, fishing, and other recreational activities, to Navy Department barges carrying supplies to bases at Quantico, Va., and to water traffic in general.

Mosquito Control in Wildlife Habitat

Extensive research on coordination of malarial control with wildlife conservation was conducted in cooperation with the Tennessee Valley Authority, the Bureau of Entomology and Plant Quarantine, the

United States Public Health Service, and Alabama and Tennessee State conservation and public health agencies. A number of areas adjacent to military cantonments were also inspected for the purpose of effecting necessary mosquito control without jeopardizing wildlife.

Laboratory Research on Food Habits

In all, 12,931 unit analyses were made of 140 different species and subspecies of fishes, amphibians, reptiles, birds, and mammals, as shown in table 3. In addition, several thousand identifications of plants, seeds and other plant parts, insects and other invertebrates, reptiles, amphibians, hairs, feathers, and skeletal material were made for various institutions and research workers engaged in wildlife investigations. Large numbers of stomachs were examined, and work progressed on food-habits studies of North American ruminants, raccoons, armadillos, bobcats, house cats, owls, mourning doves, band-tailed pigeons, white-winged doves, robins, grouse, bald eagles, bull snakes, and other kinds of wildlife. Reports were published on the food habits of the woodcock, snipe, knot, and dowitcher and on the food habits of the American coot.

Cooperative Food Habits Research

Cooperative research on the food habits of birds and mammals was conducted with 6 of the 10 cooperative wildlife research units, and 7,169 unit examinations representing 25 species were made. Students from 4 units were detailed to perform analyses in the laboratory at the Patuxent Research Refuge, Md., as follows: Alabama, 10; Virginia, 2; Missouri, 1; and Oregon, 1.

TABLE 3.—Wildlife food-habits analyses, fiscal year 1941

Kind of analysis	Fishes		Amphibians		Reptiles		Birds		Mammals		Total	
	Units	Species	Units	Species	Units	Species	Units	Species	Units	Species	Units	Species
Stomachs.....	4	1	2	2	188	18	4,432	61	1,540	25	6,166	107
Pellets.....							2,344	13			2,344	13
Scats.....							3,902	4	368	9	4,270	13
Intestinal tracts.....									2		2	2
Food from—												
Bird nests.....							46	3			46	3
Mammal dens.....									103	2	103	2
Totals.....	4	1	2	2	188	18	10,724	81	2,013	38	12,931	140

Food-habits analyses were made for Federal organizations as follows: Forest Service, 489 unit examinations of 14 species; Soil Conservation Service, 203 of 6 species; Public Health Service, 739 of 3 species; National Park Service, 25 of 5 species; and Bureau of Entomology and Plant Quarantine, 25 of 3 species. In 4 States Pittman-

Robertson Federal-aid projects were assisted in food-habits research as follows: Colorado, 149 unit examinations of 4 species; Idaho, 125 of 3 species; Mississippi, 72 of 2 species; and Wyoming, 12 of 3 species. Cooperation was extended also to 6 scientific institutions and to 7 universities and colleges.

Patuxent Research Refuge Laboratory

The food habits laboratory at the Patuxent Research Refuge, Md., completed its first year's work in the new quarters. Up-to-date laboratory facilities for the chemical analysis of feedstuffs for upland game birds were installed. Plans inaugurated for an ecological study of the refuge included the collection of plants to supplement the list of the known flora. In the experimental ponds 17 marsh and aquatic species were planted to determine whether they could be propagated with any measure of success before further experimentation was attempted.

Nutrition and Physiology of Upland Game Birds

Studies on the feeding requirements of bobwhite quail were continued in collaboration with the Bureau of Animal Industry of the Department of Agriculture. Investigations were conducted to determine the level of protein in the breeding diet that is necessary for optimum production, size, and hatchability of eggs, and the level satisfactory for winter feeding; the comparative feeding value of oats, wheat, corn, barley, and rye in maintenance diets; and the nutritive value and palatability of a variety of wild seeds and fruits. The causes of intestinal disorders in growing quail due to faulty nutrition were investigated, a bulletin published on the propagation of this important species, and a report completed on the protein requirements of quail chicks for growth, livability, and efficiency of feed utilization.

In cooperation with Cornell University and the New York Conservation Department, continued studies on the physiology of the ring-necked pheasant were concerned largely with the development of new laboratory equipment and techniques and with research on the normal physiology of the ring-neck.

Squill Fortification and Rat Control

The role of the rat as a transmitter of various human diseases is well known, and its importance is recognized by health authorities. The establishment of Army camps in areas where small rodents abound has greatly increased the likelihood of dissemination of rodent-borne diseases and added to the emphasis placed on the need for rat

control. With international conditions now making it practically impossible to obtain European red squill, an important raticide, efforts are being made to propagate it in this country, in cooperation with the Bureau of Plant Industry of the Department of Agriculture. Much of the red squill now on hand is low in rat-killing power, and a process of fortification has been developed whereby the active principle is concentrated to make the final product effective. Research is also being conducted to determine, isolate, and possibly synthesize the rat-killing principle of red squill.

Rodent and Rabbit Control

The defense of forests against rodent, rabbit, and hare damage has been an important problem for many years. Progress was made in devising improved seeding practices, mechanical protective devices, and repellents. Spraying trees grown in nurseries with a new repellent mixture just before they are transplanted into forests, has given definite protection against snowshoe hare injury in the Lake States, and similar sprays applied to deciduous trees in the northern Prairie States have given some protection against jack rabbits and beavers. These developments are in control in value damage avoidance rather than destruction of the animals.

White-winged Dove Study

The study of the food habits, economic status, and life history of the western white-winged dove in Arizona was furthered by extensive cooperation with other governmental agencies, with the Arizona Game and Fish Commission, and with individual sportsmen, ranchers, and bird students. Study of the kill represented in hunters' game bags showed that 75 percent of the doves were juveniles and 25 percent adults. Management of the species is imperative, for though conditions vary locally, there are fewer birds left than there are food, water, and nesting resources for them.

Wild Turkey Management

Wild turkey management practices on some 3,000,000 acres of Federal, State, and private lands were investigated, and experimental management was undertaken on five controlled areas covering approximately 100,000 acres. Biological investigations were completed to determine the relative suitability of various areas for proposed wild turkey refuges. Observations and experiments were conducted in controlled burning on a 3,000-acre tract, and with uncontrolled wild fire on a 5,000-acre tract.

Fur-Animal Conservation and Restoration

Fur Production and the Fur Trade

Fur supply and annual take.—The consumption of furs in the United States far exceeds the annual wild catch, estimated to be worth \$45,000,000. An increase in both volume and value of fur imports together with augmented individual incomes through employments under the defense program has developed a much larger market for furs. Lack of authentic information prevents accurate estimates on the numbers and origin of animals trapped, but trends in recent years emphasize the danger of depletion of this valuable resource.

Silver fox quota.—To prevent undermining the American fur-farming industry by a great influx of foreign pelts, imports of silver foxes, both live animals and pelts, were restricted to 100,000 units annually. This quota, first enforced during the calendar year 1940, was only slightly modified in 1941. Inability of European exporting countries to fill their allotments, however, made it possible to increase the Canadian quota from 58,000 to 70,000 units.

Selling Federal furs.—Surplus fur animals from the great reservoirs on the national wildlife refuges totaled 226,216 in the fiscal year 1940. The system devised of handling and selling furs from these sources not only supplied valuable information but also returned to the Treasury approximately \$83,000.

Cooperative Research

Reproduction studies.—Studies on the reproductive cycles of fur animals were conducted in cooperation with the Bureau of Animal Industry of the United States Department of Agriculture, Swarthmore College, and the Carnegie Institution of Washington. At Swarthmore College new work dealt with silver foxes, including length of breeding season and reasons for nonbreeding males. Research also is in progress on reproduction in minks, including studies of variation in the length of the gestation period and of effects of hormones on reproduction. The results obtained from research on the reproductive cycles of muskrats and martens were published.

Nutritional studies.—Nutritional research on fur animals was conducted in cooperation with the Bureau of Animal Industry and Cornell University, in which studies of the vitamin requirements of foxes and minks were stressed. Fox pups deficient in vitamin A were found to develop characteristic nervous symptoms, but without adverse effect on the growth rate and quality of fur. That a vitamin D deficiency can be produced in foxes was determined, and rachitic symptoms were produced experimentally by controlling the calcium-

phosphorus ratio and the vitamin D intake and eliminating sunlight. Other studies were begun on nicotinic acid, thiamin, and riboflavin deficiencies. No vitamin A deficiency symptoms were produced in minks. These animals will not tolerate a ration without fresh meat, and it was determined that raw, lean horsemeat in the experimental ration contained traces of vitamin A. Minks developed pronounced rachitic symptoms within 6 weeks when placed on a rickets-producing diet, in which there was an unsatisfactory calcium-phosphorus ration and a deficiency of vitamin D. Digestion trials on fox and mink feeds were continued and the chemical composition of horsemeat and of vesical calculi determined.

Fur-fiber investigations.—Several phases of the investigation of microscopic characters of fur fibers, initiated in cooperation with the Bureau of Animal Industry, were brought to completion. These included methods of making mounts for microscopic inspection and a modified technique for obtaining hair surface impressions. What are probably the smallest visible units of structure of animal fibers were photographed for a study of their arrangement and relationship. In silver foxes and minks the shapes of the fibers form an almost continuous series from fine to coarse, but three main types were recognized as factors contributing to fur quality.

A compilation of the main findings of published research bearing on the production of Persian lambskins was completed, an attempt was made to analyze the changes that take place in dressing the raw furs, and the effects of washing the skins immediately after pelting were studied. A new breeding program was begun in cooperation with the Bureau of Animal Industry and the Office of Indian Affairs, to test the feasibility of crossing Karakuls with Navajo sheep for the production of quality lambskins.

Rabbit-fur studies are in progress to determine the microscopic features of fibers of the undesirable woolly-coat mutation and to detect the presence of any such features of this hereditary trait in normal-coated carriers.

Fur-Animal Experiment Stations

New York.—The search for cheaper substitutes for raw meat in the ration of fur animals continues to be one of the major studies at the Fur Animal Experiment Station, at Saratoga Springs. Summer maintenance experiments with adult male and female foxes have verified previous findings on the desirability of using peanut, linseed, and soybean meals, together with beefmeal and livermeal, as complete replacements for raw meat. Following weaning, fox pups grew satisfactorily and produced good pelts on somewhat similar rations made up into pellets. A second year's work in summer feeding adult

female minks and weaned kits confirmed previous observations on the economy and advisability of partially replacing raw meat with fishmeal, tripe, and canned fish. Production of young minks by females that were fed rations in which fishmeal or tripe replaced half the canned fish was satisfactory. A portable electrocution outfit, using an ordinary 6-volt battery and designed to kill foxes for pelting where electrical current is not available, was thoroughly tested and proved to be efficient and humane. Marten and fisher pens, furring shed, assistant's residence, and a laboratory addition, heating plant, watch tower, mink colony house, and storage building were constructed under a PWA project.

California.—In a 7-year test at the Rabbit Experiment Station, at Fontana, more than 12,000 young rabbits have been used in an attempt to find the cause of diarrhea and "bloat," or enteritis, in rabbits. Many combinations of feed, the addition of vitamin and mineral supplements, and changing the ration have failed to produce, prevent, or cure bloat. Tables and charts prepared from the data thus far obtained definitely established the fact that mortality increases rapidly from the fourth to the eighth week and subsides gradually to the twelfth week, and then to maturity only an occasional death occurs. Mature bucks and does are not susceptible. To assist producers who have a market for breeding or laboratory animals, a technique was developed for accurately determining the sex of day-old rabbits. Installation of an automatic watering system has not only saved a great deal of labor but also has eliminated the drowning of infant rabbits, prevented sore dewlaps in mature rabbits, and eliminated the transmission of infection from hutch to hutch.

Maryland.—Research investigations on the muskrat were continued at the fur-animal field station on the Blackwater National Wildlife Refuge, in Dorchester County, and studies were conducted on breeding, food habits, carrying capacities, marsh populations, prime-fur period, and best methods for harvesting the fur crop. Controlled experimental breeding in marsh enclosures produced 17 litters of muskrats in 1940. A new battery of marsh-breeding enclosures was completed in September and stocked with pen-reared young of the season. Births last spring gave the first accurate information on age at sexual maturity and size of spring litters in young muskrats of known parentage. In experimental work on nutrias, two large enclosures, completed along pond edge and open marsh, were stocked to observe the reaction of the animals to native fresh-water and brackish-water flora and food-plant preferences. Trapping operations and marketing of both muskrat carcasses and pelts taken on the refuge, carried out for the first time, afforded opportunity to obtain complete data under controlled conditions. Records were kept on all muskrat weights and of sex and the black and brown color ratios.

Wildlife-Disease Research

Repellents for Disease-Carrying Rats

With the development of cotton for building insulation, its use as a lurking and nesting place by rats has become important not only from the standpoint of damage to buildings but also in disease transmission. Numerous tests were made in cooperation with the Marketing Division of the Surplus Marketing Administration, United States Department of Agriculture, for determining the rat-repellent value of the substances used for impregnating cotton insulation for fireproofing. These indicate that it is possible to fireproof cotton with chemicals that also effectively repel rats.

Scavenger Birds as Disease Carriers

Investigations of sanitation in reservoirs polluted by scavenger birds demonstrated that many of the well-known pathogenic bacteria are not destroyed by the digestive fluids of the birds. It has been shown, for example, that the tuberculosis organism not infrequently passes in a viable state through the digestive tract of turkey vultures, sea gulls, and crows. Further tests demonstrated that infectious organisms belonging to the genera *Paratyphi* and *Pseudomonas* also survive in the droppings of some of these birds. This finding is of special importance to human health.

Brucellosis Control in Buffaloes

Studies on national wildlife refuges have demonstrated that the American bison is subject to brucellosis, or Bang's disease. As many buffaloes on reservations are affected, a program of control similar to that developed for cattle was instituted, and animals between 6 and 12 months of age are now vaccinated with a nonpathogenic strain of the organism. To build up immune herds it is planned to vaccinate all young stock each year.

Blood Parasites of Birds

An extensive survey was made of the various forms of malaria organisms and related blood parasites affecting birds, embracing several hundred samples taken from the vicinity of Washington, D. C., and the Lower Souris Refuge, N. Dak. Approximately half the sharp-tailed grouse and prairie chickens from the refuge were infected with pathogenic *Plasmodium*. In the descriptions of these blood protozoa, the many species of birds affected were listed and the number of the organisms that were recognized, some of which are new to the hosts,

reported on. In the process of studying bird blood a new method was developed of staining the preparations for differentiating the various cellular elements.

Biological Aids in Botulism Control

In an effort to elucidate some of the factors involved in botulism outbreaks in water fowl, detailed investigations were made of the character of environments where the bacteria are most prevalent. Chemical tests of the reaction of the areas, determination of the availability of oxygen, and observations of the kind and quality of organic matter made it possible to designate in advance the danger points for valuable waterfowl. Published descriptions of these processes will make the control of this devastating disease in waterfowl more economical. Separation of a volatile heat-stable fraction of type C botulinus toxin also was accomplished, and this will facilitate the formulation of waterfowl-management plans for botulism control.

National Park Wildlife

Wildlife Relationships

Continuing-research projects begun several years ago included predator-Dall sheep relationships in Mount McKinley National Park, Alaska, the field work on which has been completed but not yet analyzed sufficiently for publication of the conclusions. Climatic and range conditions, however, are indicated as greater factors in the fluctuation of the Dall sheep population than is predation by wolves. The mountain sheep, or bighorn of the United States proper, also has been given much attention through a cooperative study by the Fish and Wildlife Service, the National Park Service, the Forest Service, and the States concerned. Other inventories made in cooperation with the National Park Service consisted of deer-population studies in the Acadia National Park, Maine; and bird studies in the Olympic (Wash.) and Hawaii National Parks. Wildlife studies were made in the Joshua Tree National Monument, Organ Pipe Cactus National Monument, and at a number of other southwestern national monuments, and the trumpeter swan survey progressed in Yellowstone National Park. Additional wildlife studies were made on recreational demonstration areas in New York and Pennsylvania and along the Blue Ridge Parkway.

Range-Improvement Studies

Investigation of deer, elk, and beaver utilization of forage was continued in the Rocky Mountain National Park, Colo., where overbrowsing by elk and deer, especially on the aspen, has raised a serious

problem. Plans are being made in conjunction with Pittman-Robertson projects and the Colorado Game and Fish Commission for range studies and future size control of the elk herd. Long-term range studies were continued by the use of exclusion plots on the floor of Yosemite Valley, Calif., where deer are numerous; and in Yellowstone National Park, where studies indicate that the range is slowly recovering from overuse but has not yet returned to its former carrying capacity. Overbrowsing by deer was investigated in several small eastern areas, including Hickory Run and Blue Knob Recreational Demonstration Areas, Pa., where reductions in deer populations were made through special hunting regulations.

Dual use of range by wildlife and domestic stock is being investigated in several national parks, where, to avoid hardship to livestock owners, land-acquisition agreements have provided for grazing privileges for limited periods. Through cooperative agreements between the National Park Service and the Grazing Service, grazing on the Carlsbad Caverns National Park addition, N. Mex., Grand Canyon National Monument, Ariz., and Dinosaur National Monument extension, Utah and Colo., has been handled on the basis of gradual reduction with eventual total elimination of livestock. In areas bordering on national forests, including Bryce Canyon (Utah) and Kings Canyon (Calif.) National Parks, this work is being handled on the tapering-off basis, and it is planned eventually to eliminate all grazing there. Removal of saddle horses from the bighorn lambing grounds in Glacier National Park, Mont., is expected to result in improved range conditions and better health of the wildlife. Range conditions in Death Valley National Monument, Calif., have been greatly improved by a reduction of the wild burro population. At the White Sands National Monument, N. Mex., in cooperation with local organizations, antelopes have been stocked and the range is being improved by the restoration of water holes for their use.

Wildlife Surveys and Inventories

In Kings Canyon National Park, Calif., a detailed faunal survey was completed, together with studies of range conditions. Improvements in making and recording annual wildlife inventories in the national parks have made the data more usable for management projects and for public information.

Cooperative research was continued on the aquatic life of Crater Lake National Park, Oreg., with a view to fishing improvements. A widespread outbreak of *Saprolegnia* has apparently run its course and subsided, and it is interesting to note the mention in correspondence some 50 years ago of a similar condition in the fish of Crater Lake.

Fishes of the National Parks

Progress in scientific investigations of streams and lakes in one national park has emphasized the necessity of research elsewhere on quality of streams, methods of stocking, and status of fishes released. Recent fish-cultural work in Yellowstone, Glacier, Shenandoah, Great Smoky Mountains and other national parks has assisted in shaping a sound management policy on public waters, and this has been aided by checking stations, which furnished information on the number, condition, and rate of growth of fishes taken by anglers. Management is predicated upon all known factors affecting fishes indigenous to waters of the parks and frequently involves stream improvement, new methods in technique of stocking, and modifications of creel limits and lures. In cooperation with the States, fish-cultural practices in national parks have been improved in California, North Carolina, Tennessee, and Virginia. The general trend is toward increased stocking, and improved transportation facilities have made for greater survival in the plantings. To improve aquatic resources and recreational facilities in Yellowstone National Park, more than 18,000,000 eyed eggs and fishes were planted in 1940, compared with approximately 5,000,000 in 1939.

National Wildlife Refuge Program

Acquisition of Land

Approval by the Migratory Bird Conservation Commission of Service recommendations resulted in adding 7 units to the list of national wildlife refuges, which will ultimately embrace 125,611 acres—the Chassahowitzka, Fla., Chincoteague, Md., Horicon, Wis., Lac Aux Mortes, N. Dak., Missisquoi, Vt., Parker River, Mass., and Santee, S. C.—and additions of 70 separate tracts aggregating 24,863 acres to 25 refuges now under administration. Executive orders added another 4—the Havasu Lake, Ariz. and Calif., Imperial, Ariz. and Calif., San Andres, N. Mex., and Thief Valley, Oreg., besides 13 easement refuges to be under Service control—Evanston, Wyo., Kit Carson, Colo., Lake Mason, Mont., and the following 10 in North Dakota: Prairie Lake, Pretty Rock, Snyder Lake, Springwater, Stewart Lake, Stoney Slough, Sunburst Lake, Tomahawk, White Lake, and Wintering River. These 17 involve 139,978 acres of public domain, 32,012 acres purchased, and 11,880 acquired by gratuitous easements.

Executive orders also added two refuge administrative sites—the Cabeza Prieta and the Kofa, Ariz.—and four wildlife-management areas, the latter for administration under Service custody by the conservation commissions of the four States affected: Carolina

Sandhills, S. C., Missouri, Mo., Necedah, Wis., and North Carolina, N. C., through transfer of jurisdiction over the lands, acquired under the submarginal land retirement program, from the Department of Agriculture to the Department of the Interior.

Details of the accomplishments in refuge-land acquisition are given in table 4. In addition, surveys were made of 291 miles of boundary lines and of 233 miles of interior or contiguous lines required by reason of lost and obliterated corners; 62 miles of level lines were run; 263 miles were marked to define the boundaries of existing refuges; and 109 miles of boundary lines were staked preliminary to fence construction. Survey descriptions necessary for title examinations and preparing deeds of conveyance for 465 tracts were completed for approximately 107,794 acres, of which 134 tracts of 6,935 acres with irregular boundaries were surveyed preliminary to the preparation of definitive land descriptions. Topographic surveys of 1,543 acres were made and detailed maps compiled therefrom.

TABLE 4.—Acreage (382,904) acquired or in process of acquisition for national wildlife refuges and related uses under the Migratory Bird Conservation Act, with emergency and other funds, and by gift and Executive order or proclamation

State and county	Refuge	Fiscal year 1941			Acquired other than by purchase	Acquired in previous years
		Under Migratory Bird Conservation Act and other funds ¹				
		Acquired by purchase	Pending title conveyance	Total		
Arizona:						
Mohave.....	Boulder Canyon (see also Nevada).					312, 047
Pima and Yuma.....	Cabeza Prieta.....				2 40	860, 000
Mohave and Yuma.....	Havasus Lake (see also California).				2 337, 370	
Yuma.....	Imperial (see also California).				2 28, 711	
Yuma.....	Kofa.....				2 40	660, 000
Arkansas:						
Mississippi.....	Big Lake.....		140	140		9, 542
Arkansas, Desha, Monroe, and Phillips.	White River.....	2, 488	3, 388	5, 876		102, 681
California:						
San Bernardino.....	Havasus Lake (see also Arizona).				(3)	
Imperial.....	Imperial (see also Arizona).				2 18, 130	
Colusa and Glenn.....	Sacramento.....		9, 100	9, 100		10, 776
Colorado: Cheyenne.....	Kit Carson.....				2 4 664	
Delaware: Kent.....	Bombay Hook.....		825	825		13, 252
Florida:						
Hernando.....	Chassahowitzka.....		2, 779	2, 779		
Jefferson, Taylor, and Wakulla.	St. Marks.....	1, 109	1, 819	2, 928		5 54, 222
Georgia:						
Charlton, Clinch, and Ware.	Okefenokee.....		32, 255	32, 255		5 293, 842
Jasper and Jones.....	Piedmont.....					5 28, 403
Illinois:						
Mason.....	Chautauqua.....	{ 31 6 261 }		292		5 4, 180
Carroll, Jo Daviess, Rock Island, and Whiteside.	Upper Mississippi (see also Iowa, Minnesota, and Wisconsin).					5, 256

See footnotes at end of table.

TABLE 4.—Acreage (382,904) acquired or in process of acquisition for national wildlife refuges and related uses under the Migratory Bird Conservation Act, with emergency and other funds, and by gift and Executive order or proclamation—Continued

State and county	Refuge	Fiscal year 1941			Acquired in previous years
		Under Migratory Bird Conservation Act and other funds		Acquired other than by purchase	
		Ac- quired by pur- chase	Pend- ing title convey- ance			Total
Iowa:					
Kossuth	Union Slough	51		51	1,041
Allamakee, Clayton, Clin- ton, Dubuque, Jackson, and Scott.	Upper Mississippi (see also Illinois, Minnesota, and Wisconsin).				24,441
Kentucky: Lyon and Trigg	Kentucky Woodlands		1,702	1,702	5 46,498
Louisiana:					
Plaquemines	Delta	4,496	2,841	7,337	5 44,292
Cameron	Sabine		438	438	147,340
Maine: Washington	Moosehorn	654	3,004	3,658	5 18,149
Maryland:					
Worcester	Chincoteague		112	112	
Anne Arundel and Prince Georges.	Patuxent				5 2,643
Massachusetts:					
Barnstable	Monomoy		2,946	2,946	
Essex	Parker River		645	645	
Michigan: Schoolcraft	Seney	391	10,773	11,164	76,650
Minnesota:					
Marshall	Mud Lake		5,932	5,932	60,216
Aitkin	Rice Lake	307		307	11,152
Cottonwood	Talcot Lake				5 80
Becker	Tamarac	2,422	28,220	30,642	23,189
Houston, Wabasha, and Winona.	Upper Mississippi (see also Illinois, Iowa, and Wis- consin).	8 32	2,461	2,493	14,478
Missouri:					
Stoddard and Wayne	Mingo		22,498	22,498	
Chariton	Swan Lake	885		885	9,788
Montana:					
Blaine	Black Coulee				5 640
Hill	Lake Thibadeau				5 19
Roosevelt and Sheridan	Medicine Lake		640	640	22,824
Nebraska: Garden	Crescent Lake		720	720	42,635
Nevada:					
Clark	Boulder Canyon (see also Arizona).		112	112	346,450
Elko and White Pine	Ruby Lake		40	40	35,578
Humboldt and Washoe	Sheldon (see also Oregon)	40	40	80	5 579,688
New Jersey: Atlantic	Brigantine	99	7,374	7,473	1,769
New Mexico:					
Chaves	Bitter Lake	4,974	840	5,814	16,869
Socorro	Bosque del Apache	2,907		2,907	52,993
Dona Ana	San Andres				57,215
New York: Seneca	Montezuma	40	494	534	5 5,397
North Dakota:					
Foster and Stutsman	Arrowwood		39	39	13,303
Pierce	Buffalo Lake				5 3
Burke and Ward	Des Laes		10	10	5 13,976
Nelson	Johnson Lake				7 4
Ramsey and Towner	Lac Aux Mortes (formerly Lake Alice).	8		8	7 2
Kidder	Lake George				5 30
Dunn	Lake Ilo		2,395	2,395	8
Burleigh and Kidder	Long Lake		2,627	2,627	7,291
Burke and Mountrail	Lostwood		560	560	23,405
Bottineau and McHenry	Lower Souris		478	478	58,095
Renville and Ward	Upper Souris	19	855	874	31,135
Oregon:					
Umatilla	Cold Springs		33	33	2,677
Lake	Hart Mountain	720	28,558	29,278	218,960
Harney	Lake Malheur (Malheur)	317		317	93,487
Harney	Malheur (Warm Springs)		14,751	14,751	
Lake	Sheldon (see also Nevada)				627
Baker and Union	Thief Valley				2 1,495
South Dakota: Charles Mix	Lake Andes	40	40	80	263

See footnotes at end of table.

TABLE 4.—Acreage (382,904) acquired or in process of acquisition for national wildlife refuges and related uses under the Migratory Bird Conservation Act, with emergency and other funds, and by gift and Executive order or proclamation—Continued

State and county	Refuge	Fiscal year 1941			Acquired other than by purchase	Ac- quired in pre- vious years
		Under Migratory Bird Conservation Act and other funds				
		Ac- quired by pur- chase	Pend- ing title convey- ance	Total		
Tennessee: Lake and Obion.....	Lake Isom.....		324	324		1,521
Texas: Aransas and Refugio.....	Aransas.....	381	963	1,344		53,917
Vermont: Franklin.....	Missisquoi.....		1,656	1,656		
Washington:						
Stevens and Pend Oreille.....	Little Pend Oreille.....		1,451	1,451		\$ 36,007
Skagit.....	Skagit.....		2,183	2,183		
Spokane.....	Turnbull.....	1,460		1,460		9,449
Pacific.....	Willapa.....		325	325		2,968
Wisconsin:						
Dodge and Fond du Lac.....	Horicon.....		13,767	13,767		
Juneau.....	Necedah.....					\$ 12,999
Buffalo, Crawford, Grant, LaCrosse, Trempealeau, and Vernon.....	Upper Mississippi (see also Illinois, Iowa, and Minne- sota.)		\$ 543	543		54,502
Wyoming:						
Uinta.....	Evanston.....				24 360	
Teton.....	National Elk.....		320	320		\$ 21,175
Total, Migratory Bird Conservation Act.....		23,839	210,372	234,211		(10)
Total, other funds.....		293	3,644	3,937		(10)
Total, other than by purchase.....					144,756	(10)

¹ All but 4 entries (explained in footnotes thereto) came under Migratory Bird Conservation Act funds.

² Set aside by Executive order or proclamation.

³ As acreage has not yet been computed by States, total acreage for refuge is entered under Arizona.

⁴ Held under easement.

⁵ Corrected since last year.

⁶ \$1,000,000 fund provided through Executive Order No. 6724 of May 28, 1934.

⁷ Acquired by gift.

⁸ Upper Mississippi River Wildlife and Fish Refuge fund.

⁹ Federal Emergency Relief Administration and Resettlement Administration funds.

¹⁰ Total omitted, as entries in column are for only those refuges on which acquisition work was involved during the year.

Administration and Management of Refuges

Establishment of 4 new national wildlife refuges brought the total number administered by the Service to 267 (13,740,304 acres) (table 5)—251 (9,531,790 acres) in the United States and 16 (4,094,232 acres) in Alaska, Hawaii, and Puerto Rico. The Service also administers 19 experimental and administrative units (12,457 acres) on which wildlife is protected. With 2 refuges placed under active administration for the first time and resident personnel assigned to them, 93 refuges (10,707,681 acres) were being actively operated by a field force of 262 permanent and 37 part-time employees. Also, 6 easement refuges in South Dakota and 4 in Montana were put under supervision of personnel at nearby refuges, bringing to 84 the number of easement areas so administered. Surveys over the entire national system show in-

creased utilization of the refuges by wildlife and demonstrate the need for further acquisition and development of refuge areas not only for waterfowl but for other species of wildlife in need of protection.

TABLE 5.—Classification and acreage of national wildlife refuges administered by the Fish and Wildlife Service

Classification	Number	Acres
For migratory waterfowl.....	178	3, 554, 356
For other migratory birds, small upland game, fur animals, and other wildlife.....	25	3, 436, 131
For colonial nongame birds.....	50	107, 679
For big game.....	14	6, 642, 138
Total.....	267	13, 740, 304

Under the provisions of Reorganization Plan No. IV, which transferred the soil and moisture conservation activities on lands under the administration of agencies within the Department of the Interior to this Department, funds were made available for soil and moisture conservation projects on some of the refuges. Projects were initiated and excellent results obtained on seven refuges.

The Service released to the War Department for bombing fields, gunnery ranges, emergency landing fields, and other defense purposes, tracts on several refuges where it was determined that such use would not unduly detract from the value of the refuges to wildlife.

BIRD REFUGES

New refuges.—Three new bird refuges were established as follows:

The Havasu Lake Refuge (37,370 acres), Mohave and Yuma Counties, Ariz., and San Bernardino County, Calif., by Executive order of January 22, 1941, including lands acquired by the Bureau of Reclamation for the Parker Dam Project, as a refuge for migratory birds, principally for wintering waterfowl.

The Imperial Refuge (46,841 acres), Yuma County, Ariz., and Imperial County, Calif., by Executive order of February 14, 1941, including lands acquired by the Bureau of Reclamation for the Imperial Reservoir of the Colorado River Storage Project, because of its excellence also as a waterfowl wintering area.

The Thief Valley National Wildlife Refuge (1,495 acres), Baker and Union Counties, Oreg., by Executive order of October 22, 1940, as a resting place for waterfowl, particularly ducks, but subject to its primary use for reclamation purposes.

By agreement with the South Carolina Public Service Authority, part of the Santee-Cooper Hydroelectric and Navigation Project, in Berkeley and Clarendon Counties, was leased to the Service as a refuge. Construction work will be needed to make it of maximum value to wildlife.

Water conditions.—As the result of a good spring run-off and plentiful rains, most of the Great Plains waterfowl nesting areas were in excellent condition. In North Dakota, several units within the Arrowwood Refuge—in previous years almost dry—had plenty of water for the summer; the Des Lacs and Upper Souris Refuges each had a good supply; the Lower Souris Refuge had enough to make it attractive to nesting birds; and most of the easement refuges had more than in recent years, particularly the Lake Ardoch, Lake Tewaukan, Lac Aux Mortes, and Lake Ilo Refuges. In South Dakota, the Sand Lake Refuge, with all pools filled, was in the best condition since its establishment and the ponds on all but one of the easement refuges had plenty of water. On the Mud Lake Refuge, Minn., all the pools were full and water was still coming in.

Use by wildlife.—The plentiful water supply resulted in much improved food and cover and put most of the refuges in an ideal condition to take care of the birds and other wildlife using them.

Although their nesting season was not completed at the close of the year, it was evident that considerably more Canada geese will be produced on the Bear River Refuge, Utah, than previously. The species is also nesting in increased numbers on the Sand Lake Refuge, S. Dak.

At the peak of the fall waterfowl concentration there were about 1,115,000 pintails and many thousands of geese and other ducks on the Sacramento Refuge, Calif. Early in November about 65,000 lesser snow and white-fronted geese and 50,000 ducks feeding in a refuge field near a United States highway attracted much attention from passing motorists.

On the Lacreek Refuge, S. Dak., during the fall migration, canvasbacks increased about 3,500 percent over the previous year and redheads 600 percent, and at the height of the migration mallards numbered 150,000 and pintails 50,000, compared with 75,000 and 7,500 respectively the year before.

As counted late in the summer of 1940, the rare trumpeter swan had again increased in numbers in the United States, from 199 in 1939 to 212. Of these 128 were on the Red Rock Lakes Refuge, Mont., and adjacent lakes; 78 in Yellowstone National Park; and 3 each on the Malheur Refuge, Oreg., and the National Elk Refuge, Wyo., where they had been transferred by the Service because of the ideal habitat afforded.

Upland game birds also increased decidedly on many refuges. Ring-necked pheasants were so numerous on the Sand Lake Refuge, S. Dak., that the State was permitted to trap more than 8,000 for stocking purposes. On the Arrowwood Refuge, N. Dak., sharp-tailed grouse and prairie chickens increased from 1,728 to 2,110; ring-necked pheasants, from 84 to 3,849; and Hungarian partridges, from 172 to 1,051.

BIG-GAME REFUGES

New refuges.—The San Andres National Wildlife Refuge (57,215 acres) in Dona Ana County, N. Mex., partly within the Jornada Experimental Range and partly within New Mexico Grazing District No. 4, was set aside by Executive order of January 22, 1941, for the protection primarily of the desert bighorn sheep, antelope, and mule deer.

Conditions on big-game areas.—The numbers of big-game animals on the fenced big-game areas are given in Table 6.

TABLE 6.—Number of animals on fenced big-game areas maintained by the Fish and Wildlife Service

ANIMALS AS OF MAY 31, 1941

Refuge	Buffalo	Elk	Antelope	Bighorn sheep	Deer		Texas longhorn	Total
					White-tailed	Mule		
National Bison Range, Mont.	455	54	-----	11	35	110	-----	665
Fort Niobrara National Wildlife Refuge, Nebr.	134	30	-----	-----	7	5	31	207
Sullys Hill National Game Preserve, N. Dak.	16	10	-----	-----	14	-----	-----	40
Wichita Mountains Wildlife Refuge, Okla.	520	178	32	-----	839	-----	205	1,774
Total	1,125	272	32	11	895	115	236	2,686

YOUNG BORN IN CALENDAR YEAR 1940

National Bison Range, Mont.	85	21	-----	-----	6	29	-----	141
Fort Niobrara National Wildlife Refuge, Nebr.	23	9	-----	-----	2	-----	7	41
Sullys Hill National Game Preserve, N. Dak.	2	2	-----	-----	2	-----	-----	6
Wichita Mountains Wildlife Refuge, Okla.	114	20	7	-----	40	-----	33	214
Total	224	52	7	-----	50	29	40	402

There were about 150 Gaillard mountain sheep on the Cabeza Prieta and Kofa Game Ranges, Ariz., and at least 25 Mexican antelopes and 100 Sonoran peccaries on the Cabeza Prieta. On the Kofa about 100 wild burros remained all year and mule deer were abundant around water holes.

About 300 Nelson's mountain sheep inhabited the Desert Game Range, Nev., and about 350 mule deer wintered in its southern part. A few of the elk placed there by the State in 1935 were seen, but the range is not believed to be particularly adapted to this species.

It was estimated that about 10,000 antelopes used the Sheldon National Antelope Refuge, Nev. and Oreg., the Charles Sheldon Antelope Range, Nev., and the Hart Mountain Refuge, Oreg. About 2,000 mule deer and 300 wild horses were on the Sheldon Refuge and Sheldon Range.

Around 1,500 white-tailed and 100 mule deer were counted during the winter on the Little Pend Oreille Refuge, Wash., and at least 20 black bears were believed to be there during part of the year.

By aerial count in March the Jackson Hole herd of elk numbered

17,902. Of these, 10,940 were on the National Elk Refuge, Wyo., where from January 22 to March 20 they were fed 37,078 bales of hay and 2,063 bags of cottonseed cake. About 60 mule deer and 25 moose wintered on the refuge.

PUBLIC USES OF REFUGES

There was a marked increase in the removal of surplus fur animals and timber from the refuges. Where the development of waterfowl habitat has been completed, fur animals had so increased on a number of refuges as to make large-scale removals necessary. For the first time, muskrat-trapping rights, formerly vested with the vendor of the land, were exercised by the Service on the important muskrat-producing Blackwater Refuge, Md., and fur animals were trapped on a revenue basis on the Upper Mississippi Refuge. Intensive development on several refuges for pool clearing and habitat improvement resulted in the sale of large quantities of wood, mainly for domestic purposes, to persons living nearby.

There were issued 955 permits for trapping fur animals on refuges, and 1,897 for grazing cattle, horses, and other domestic livestock; harvesting hay; cutting and removing timber and brush for fuel; cultivating refuge lands, including raising food and cover for wildlife on a sharecrop basis; pasturing bees; picking fruit; and other uses.

The disposal of big-game animals from the fenced herds was not so extensive as formerly, as the ranges were in much better condition, through drastic reductions of herds in previous years and better climatic conditions. In all, 120 buffaloes, 52 elk, 15 mule deer, and 6 Texas longhorns were sold or donated for exhibition or propagation or for butchering.

Thousands of persons used many of the refuges for fishing, swimming, picnicking, and other forms of recreation, and thousands more visited them to see the wildlife and learn more about conservation work. Several civic organizations sponsored trips to nearby refuges. During the period the elk were concentrated on the winter-feeding grounds, as many as 969 persons a day visited the National Elk Refuge, Wyo., to watch them.

The total revenue from the use of refuges and sale of all products was the largest yet realized—\$99,000. In accordance with the law, 25 percent of this was turned over to the counties in which the refuges are situated and the remainder deposited in the Federal Treasury.

Refuge Development

ENGINEERING WORK

Preliminary surveys were made for engineering work on 47 refuges; construction plans for development and water control prepared for

54; and construction work was laid out and inspected on 24 areas being developed by WPA labor and on 37 being developed by CCC labor. One hydraulic engineer was occupied in negotiating for, filing, and protecting water rights affecting the refuges.

Following the completion of the first of three pools planned for the Swan Lake Refuge, Mo., there was sufficient run-off to fill it to the desired level, thus converting a formerly dry bottomland into an excellent lake and marsh of about 2,000 acres that is now being used by large concentrations of waterfowl. Work was begun on water-control structures at the Wheeler Refuge, Ala., and construction in connection with the restoration of the Lower Klamath Refuge, Calif. and Oreg., was about half completed.

COOPERATION WITH THE WORK PROJECTS ADMINISTRATION

Federal WPA funds of \$412,102, allocated to the Service for developing 21 refuges, provided a total of 5,959 man-months of employment, \$272,436 being expended for construction work on 12 refuges and \$139,666 for other types of work on 9. In addition, \$668,778 in WPA funds, supplemented by \$229,104 contributed by the Service, was made available for 24 Service-sponsored State projects that provided a total of 11,959 man-months of employment.

Inspection of proposed projects.—Under cooperative understanding, 240 applications for drainage and conservation projects submitted to the WPA were referred to the Service for review as to their possible effects on wildlife. Of these, 36 were concerned with drainage of agricultural lands for flood control and land use; 53 with malaria-mosquito control; and 151 with miscellaneous conservation projects, 87 of which were for soil conservation in the Southern and Southwestern States. The Service found no objection to 184 of the projects but recommended conditional or partial approval of 52 and unconditional disapproval of 4 that threatened to be unnecessarily detrimental to wildlife or wildlife habitat.

NATIONAL YOUTH ADMINISTRATION WORK

NYA labor, which is particularly valuable because it can be used for maintenance, research, and other types of work not suitable for personnel of other agencies, again supplemented CCC and WPA labor on a number of refuges in forest stand improvement; fire hazard reduction; wildlife surveys; maintenance of winter feeding stations; plant collections; construction of refuge signs, small boats, picnic tables and benches, and office equipment; and miscellaneous repair and maintenance.

CIVILIAN CONSERVATION CORPS ACCOMPLISHMENTS

In 25 States 36 CCC camps continued development work on 34 national and 1 State wildlife refuge designed to improve wildlife habitat and to facilitate administration. Practical training and instruction in the construction and repair of roads, bridges, fences, telephone lines, dams, dikes, and lookout towers and the operation and servicing of heavy equipment made important contributions to national defense by fitting enrollees for behind-the-lines defense jobs. About 98 percent of the supervisory personnel gave on-the-job training to more than 90 percent of the enrollees, frequently supplying individual and highly specialized training where group instruction was not feasible; and after working hours about 87 percent of this personnel taught an average of 10 courses at each camp. Half a million enrollee hours were devoted to the field training and a quarter million hours to the classroom work. Special instructors, obtained through State and local boards of vocational education, gave courses in radio, carpentry, welding, auto mechanics, electricity, metal work, and equipment operation and repair. The number of enrollees who obtained employment in private industry increased by 23 percent over 1940.

Special effort in teaching each man to do his job quickly, efficiently, and safely reduced the number of accidents per 10,000 man-days of work from 1.13 in 1940 to 0.872; and the Tule Lake (Calif.) Camp FWS-3 completed 40 consecutive months of work without a single lost-time or fatal accident.

Throughout the year detachments from Back Bay (Va.) Camp FWS-1 helped prepare the Fort Story Military Reservation for occupancy by National Guard regiments and selective service trainees, and in May a company of veteran enrollees began work on the Fort Sill Military Reservation, Okla. Despite work on military reservations and the emphasis upon training for places in industry and noncombatant defense posts, there was no diminution of effort in wildlife-restoration work. Important construction projects completed included the Gamma Dam on the Wichita Refuge, Okla., the Burgantine Dam on the Aransas Refuge, Tex., and the dikes for the upper pool on the Swan Lake Refuge, Mo.

RESPONSE OF WILDLIFE AND ITS ENVIRONMENT

To expedite the rehabilitation of wildlife refuges, approximately 725,000 pounds of seeds and propagules of marsh and aquatic vegetation; 1,700,000 trees, shrubs, and vines; and nearly 27,000 pounds of seeds of grasses and other upland herbaceous vegetation were planted on denuded areas and in range revegetation. Most of the woody plants were obtained through the Soil Conservation and Forest Services,

but the other planting materials were collected largely on refuge lands. This brings the total plantings of trees and shrubs to nearly 12,500,000 and of aquatic propagative material to 1,750,000 pounds since the inception of extensive biological development programs in 1936.

As a result of these measures areas that 5 years ago presented desolate pictures of the effects of unwise drainage, drought, overgrazing, and general land abuse look entirely different today: dry lake beds and drained marshes again support luxuriant stands of vegetation and attendant wildlife populations; and overgrazed and eroded uplands, where only noxious weeds or barren soil were present, are rapidly becoming covered with protective vegetation, furnishing food and cover for wildlife. These changes, gradual but steady, are focusing attention on biological management rather than on physical development on areas that have been under administration for several years.

Restocking with wildlife surpluses.—That habitat improvement has resulted in increased wildlife populations has been demonstrated by the necessity of removing surpluses from many areas to keep the populations within the bounds of available food-supply. In keeping with the policy of the Service to utilize renewable organic surpluses, the animals so removed have been used to restock depleted wildlife areas wherever possible.

The Texas Fish, Game, and Oyster Commission restocked various parts of that State with 600 white-tailed deer and 50 wild turkeys live-trapped on the Aransas Refuge, and deer from the Blackbeard Island Refuge, Ga., the Cape Romain Refuge, S. C., and the National Bison Range, Mont., also were used to restock Federal and State lands. Six elk were donated from the Fort Niobrara Refuge to Nebraska authorities for restocking; 18 from the Wichita Mountains Refuge, Okla., to Mexico; and 15 from the National Bison Range to Montana. Thirty-four antelopes were transferred from the Hart Mountain Refuge, Oreg., to Oregon and Washington State authorities. About 8,000 ring-necked pheasants were taken from the Sand Lake Refuge, S. Dak., and more than 400 from the Camas Refuge, Idaho, for restocking purposes.

Surplus fur animals were taken as an annual crop from 16 refuges. In many cases muskrats had to be removed before aquatic vegetation could be successfully established, and where practicable the animals were live-trapped and used for restocking. Fishes were taken from several refuges by State authorities for restocking and by sport and commercial fishermen.

Disposition of other surpluses.—As they become available other organic surpluses are utilized as management practices dictate. For instance, timber products that must be removed to maintain a healthy forest stand are sold. Parts of refuges are maintained in an open condition through grazing privileges, cultivation by cooperative agree-

ment with neighboring farmers, and the sale of hay. These measures not only yield revenue to the Government, but maintain refuge lands in desirable ecological condition and often provide supplementary food for wildlife. It is anticipated, however, that the need for production of supplementary food crops will decrease as natural food resources are built up.

Fish and Wildlife Management

Federal Aid in Wildlife Restoration

During the third year of operation of the Pittman-Robertson Federal Aid to Wildlife Restoration Act, in order to meet the needs of expanded programs outlined by the States, appropriations for wildlife restoration increased to \$2,500,000, having begun with \$1,000,000 in 1939. Florida, Louisiana, and Montana enacted assent legislation, leaving Georgia and Nevada the only States that have failed to take advantage of the benefits offered by the act.

The 46 participating States submitted and had approved 265 wildlife restoration projects, involving Federal funds of \$2,223,486.23, which, augmented by the 25 percent of the total cost that must be borne by the States, brought the total estimated cost of projects to \$2,964,648.31. Of the 265 projects, 73 (\$721,499.85) were for purchase of lands and waters adaptable as feeding, resting, or breeding places for wildlife; 101 (\$1,017,125.97) for development of lands and waters and improvement of conditions to benefit wildlife; 79 (\$1,133,344.35) for surveys and investigations to ascertain wildlife conditions, populations, and needs and recommend beneficial management practices; and 12 (\$92,678.14) for needed direction and supervision of the wildlife investigations and restoration measures undertaken.

Restoration programs of the States reveal varied problems, but those of States in the same geographic regions show similarity. The West is primarily interested in deer, elk, and antelopes; but game birds, fur animals, and desert species also receive their proper share of attention in development, land-acquisition, and research projects. The Midwestern and Lake States, being principally agricultural in character, have programs stressing beneficial practices for farm-land wildlife, including pheasants, quails, rabbits, and small fur animals. In the South, bobwhites attract considerable attention, but wild turkeys, white-tailed deer, and fur animals also receive attention. In the Northeastern States, where forest wildlife is abundant and subject to great hunting pressure but where farm-land species also are important, projects are concerned with deer, ruffed grouse, pheasants, rabbits, and fur animals. Projects to benefit waterfowl are not of a regional nature and are interspersed throughout the States.

Western States, where ample summer range for deer and elk is available at high elevations but where winter range at lower elevations is often inadequate to carry the present populations, are emphasizing the purchase of lands to provide winter feeding grounds, and several States, notably Washington and Utah, are engaged in long-term land-acquisition programs designed to solve this problem. In the South, several States are meeting the need for more seed stock of white-tailed deer by restocking, and since the beginning of the Federal-aid program, Virginia has released more than 800 of these animals on protected areas in western sections. New Mexico and Texas have successfully trapped and redistributed antelopes. In the stocked areas predatory populations frequently have to be reduced to afford the transplanted animals a better chance to survive and increase.

Many investigational and developmental activities relating to fur animals, particularly beavers and muskrats, are being conducted. In 9 States the live-trapping of beavers where abundant and their release in suitable areas in need of seed stock has greatly extended their range. In Idaho, about 1,200 beavers were transplanted at a cost of \$2.98 each, and in Alabama and North Carolina the determination and testing of methods to increase the carrying capacities of marshes for muskrats were undertaken.

As the term implies, farm-land wildlife includes all species found on agricultural lands, but it usually brings to mind quails, pheasants, rabbits, and small fur animals. In the Northern States the introduced ring-necked pheasant is by far the most numerous species, and in the South the quail is found in greatest numbers. By improving habitat, establishing small seed-stock refuges, correlating wildlife measures with Agricultural Adjustment Administration and Soil Conservation Service practices, and furnishing seed stock where needed, the States have appreciably enhanced opportunities for the survival and increase of populations. On its Rose Lake Wildlife Experimental Station, Michigan is correlating wildlife management practices and approved agricultural procedures in an effort to harmonize the two and encourage the expansion of farm game populations through dissemination of the findings. With its State-wide investigation project for guidance, Indiana is establishing and developing small seed-stock refuges on waste parts of farms; and Illinois, Nebraska, Virginia, and other States are conducting similar activities.

One result of this cooperative program for wildlife restoration has been a better understanding than ever before between the several State fish and game departments and the Fish and Wildlife Service. Moreover, many States that formerly were financially unable to undertake desired wildlife restoration measures are now doing so, and thereby have greatly improved their relations with both land-

owners and sportsmen. The status of the Federal aid funds for the year is given in table 7.

TABLE 7.—Status of Federal Aid to Wildlife Restoration Funds for the fiscal year 1941

State	Federal apportionment fiscal year 1941	Unobligated balance June 30, 1940 ¹	1941 funds obligated June 30, 1940	Federal funds unobligated July 1, 1940	Obligations during fiscal year 1941	Balance June 30, 1941
Alabama	\$37,313.40	\$12,570.86		\$49,884.26	\$49,884.26	
Arizona	47,979.82	1,219.74		49,199.56	39,583.49	\$9,616.07
Arkansas	27,925.05	10,776.74		38,701.79	24,602.51	14,099.28
California	98,821.03	54,226.58		153,047.61	71,014.93	82,032.68
Colorado	60,515.49		\$16,186.54	44,328.95	44,328.95	
Connecticut	5,853.34	264.09		6,117.43	6,117.43	
Delaware	3,068.18		3,044.32	23.86	23.86	
Florida	31,225.15	18,541.22		49,766.37	21,360.27	28,406.10
Georgia ²	32,644.80	20,473.33		53,118.13		² 53,118.13
Idaho	48,742.02		23,548.98	25,193.04	25,193.04	
Illinois	67,006.66		6,596.50	60,410.16	58,370.64	2,039.52
Indiana	73,830.83	30,538.53		104,369.36	95,623.95	8,745.41
Iowa	48,116.54	20,607.45		68,723.99	27,260.29	41,463.70
Kansas	42,744.97	12,293.10		55,038.07	20,540.45	34,497.62
Kentucky	31,942.31	11,243.38		43,185.69	13,822.37	29,363.32
Louisiana	32,687.63			32,687.63	25,473.65	7,213.98
Maine	27,262.21		2,736.71	24,525.50	24,524.17	1.33
Maryland	15,857.18	1,912.37		17,769.55	5,534.94	12,234.61
Massachusetts	12,987.48		6,987.08	6,000.40	5,220.70	779.70
Michigan	127,322.54	45,628.75		172,951.29	79,798.09	93,153.20
Minnesota	74,269.58	28,280.88		102,550.46	69,274.52	33,275.94
Mississippi	56,512.13		3,281.93	33,230.20	33,230.20	
Missouri	55,692.42		29,123.87	26,568.55	26,568.55	
Montana	69,184.95	41,956.56		111,141.51	97,071.18	14,070.33
Nebraska	54,047.58		774.38	53,273.20	40,948.73	12,324.47
Nevada ²	43,456.27	26,462.95		69,919.22		² 69,919.22
New Hampshire	10,694.05		9,329.21	1,364.84	1,364.84	
New Jersey	22,969.35	7,584.37		30,553.72	30,553.72	
New Mexico	50,471.83	23,992.13		74,463.96	27,212.11	47,251.85
New York	120,163.43	16,891.65		137,055.08	137,055.08	
North Carolina	44,732.03		38,796.70	5,935.33	5,630.66	304.67
North Dakota	32,610.53	11,912.53		44,523.06	42,062.90	2,460.16
Ohio	102,679.09	57,443.34		160,122.43	72,735.07	87,387.36
Oklahoma	40,479.83		33,591.40	6,888.43	6,888.43	
Oregon	49,519.26	20,987.92		70,507.18	47,064.14	23,443.04
Pennsylvania	119,218.65		10,496.13	108,722.52	108,722.52	
Rhode Island	1,605.31		1,059.86	545.45	545.45	
South Carolina	26,375.27	9,839.15		36,214.42	36,214.42	
South Dakota	37,740.08	20,668.42		58,408.50	58,408.50	
Tennessee	28,041.68			28,041.68	28,041.68	
Texas	120,297.99		43,802.81	76,495.18	76,495.18	
Utah	42,065.45		14,674.19	27,391.26	27,391.26	
Vermont	10,292.89	1,389.95		11,682.84	3,924.32	7,758.52
Virginia	38,771.95		17,109.49	21,662.46	21,662.46	
Washington	56,525.42	17,281.99		73,807.41	73,807.41	
West Virginia	34,014.37		33,807.86	206.51	206.51	
Wisconsin	63,149.37	37,286.12		100,435.49	82,139.52	18,295.97
Wyoming	40,572.61	10,288.90		50,861.51	50,861.51	
Total	2,300,000.00	572,563.00	294,947.96	2,577,615.04	² 1,844,358.86	733,256.18

¹ Does not include funds unexpended and unobligated during availability and transferred for carrying out the provisions of the Migratory Bird Conservation Act.

² Not eligible to participate.

³ Unexpended funds on completed projects have been deducted from this column and credited for future use.

Propagation and Distribution of Food and Game Fishes

Hatchery Production

Records of production at the 116 fish-propagating units are not as yet complete, but preliminary summaries indicate a marked recession in gross hatchery production in comparison with the preceding year.

The 1941 output of fish and fish eggs was 5,878,000,000, a drop of 20.57 percent from the 7,400,000,000 total achieved in 1940. Analysis of the detailed records gives no basis for supposition that the efficiency of the Federal hatcheries has been impaired to a corresponding degree.

The decline is attributed principally to a curtailment in the handling of fertilized eggs of the cod, haddock, and pollock off the New England coast. This offshore work has been considered as salvage, rather than a strictly fish-cultural activity, and has been periodically adjusted to meet current conditions. The quantity of eggs of these species incubated and hatched at the Service's hatcheries was not below normal levels. The production of fry, fingerlings, and larger fish was actually in excess of the output of comparable groups during the preceding year. This is strictly in line with the Service's policy of rearing the hatchery production, particularly the game fish, to the largest possible size before release. The increased survival assured by this procedure should more than offset any numerical decrease in planting stock.

There was an increase in the gross production of several species, including chinook salmon, lake trout, brook trout, Loch Leven trout, and rainbow trout. Reduction in the output of largemouth black bass was insignificant and was compensated by the increased size of the fish.

The bass hatchery at Arcadia, R. I., and the salmon hatchery at Leavenworth, Wash., were among the new units entering production for the first time this year, and their initial production was naturally below their ultimate capacity. A new cooperative trout-rearing unit, constructed by the Forest Service in the Allegheny National Forest, was placed in operation for the first time. These units, often equivalent in facilities and equipment to a small hatchery, are increasing in importance in the Government's program of management of recreational resources.

Emphasis was placed on improvement of distribution practices and methods. There was approved by the Secretary of the Interior a statement of distribution policy that gives the various agencies of the Federal Government priority in assignment of fish from Federal hatcheries. Public waters not under Federal jurisdiction enjoy secondary priority, and allotments to private waters are contingent upon the availability of fish.

There has been a continuing effort to improve and modernize hatchery technique and equipment. Special attention has been given to the development of satisfactory and economical diets for trout, an urgent need because of the rising cost of fish food. The practical application of the results of the years of experimentation is proving definitely beneficial.

The relationships between fish-hatchery operations and the harvest of fish, either commercial or game species, are, in general, indirect and inferential, but these activities are of significance to national defense, though not susceptible of precise measurement. Even without a positive showing that the basic aquatic food resources of the Nation have been augmented by millions of pounds of fish through artificial propagation, the contribution to conservation remains a contribution to general welfare.

COMMERCIAL SPECIES

Coastal waters.—It has been pointed out elsewhere that fewer eggs of the cod, haddock, and pollock were fertilized and returned to natural spawning grounds. The principal reason for this curtailment was that various factors diminished the intensity of commercial fishing for these species in the territory served by the three New England marine hatcheries. An increase of almost 100 percent in the production of flatfish fry was most encouraging, since there is evidence that planting these fry is a thoroughly practical means of stimulating local inshore fisheries. While the 1941 spring run of shad was not such as to yield a record collection of eggs, the hatchery work was discontinued while eggs were still available because high water temperatures prevented successful incubation. On the East coast, Atlantic salmon were again produced in limited quantities at the Craig Brook (Maine) hatchery, this being one element of a general program for the restoration of this species. More chinook and chum salmons were produced on the Pacific coast, although there was a moderate reduction in the output of silver and sockeye salmons. An unusually large run in the Sacramento River contributed to the chinook increase.

Interior waters.—Aside from the activity in the Great Lakes area, the chief work with interior commercial species was the planting of fertilized buffalofish eggs in the Upper Mississippi River. The output of whitefish was limited, but more than 1,500,000 lake trout were reared to fingerling size before release. This policy is expected to give much more positive results than the older hatchery methods, which have failed to stem the depletion in the country's most important inland fishery. Some 46,000,000 pikeperch were handled, representing a small portion of the hundreds of millions of these fish formerly produced at the Federal hatchery on Lake Erie. This establishment was transferred to the State of Ohio, pursuant to Congressional action. Late in the year preparations were made to undertake the artificial propagation of mussels on a practical basis, applying methods that had been developed by laboratory experiments over several years.

GAME SPECIES

Since improving angling is highly important in the general Federal program for recreation and land management, the attention given to the culture of game species was intensified, and the results were, on the whole, gratifying. Three species of trout, the grayling, and the Atlantic and landlocked salmons were produced in larger numbers than last year, and the average size was increased by retaining these fishes at the hatcheries and nurseries for longer periods. The same is true with reference to the black basses, a group that probably satisfies the angling demands of more people than other sport or panfishes. Since the crappie, sunfishes, and catfishes have a high level of natural reproduction, minor fluctuations in hatchery output are of little significance. All stocking needs for these species can be met with normal effort.

The policy of the Soil Conservation Service and other Federal agencies of encouraging the construction of farm ponds stimulated a peak demand for panfishes for such waters. Every reasonable effort is exerted to assure an adequate supply of these fishes to start domestic ponds on a proper basis.

Forage fishes were propagated at the Leetown (W. Va.) experimental hatchery and planted in local waters that had been shown to be deficient in this food element.

The public expects good fishing in the national parks, and the work of the hatcheries operated for the benefit of the parks during 1941 should justify this expectation. The run of black-spotted trout in Yellowstone National Park, as indicated by egg collections, has continued its upward trend. A large supply of fingerling trout was made available for the waters of Glacier National Park by completion of a new hatchery at Creston. Forest Service waters, particularly on the demonstration area in the Pisgah National Forest, were placed in better condition to meet the ever-increasing invasion by anglers.

The production of larger game fishes requires more food, care, and attention. Increasing costs of fish food and shortage of personnel have, therefore, imposed special handicaps on this phase of the hatchery activities. Nevertheless, as management programs for the interior waters are perfected, the hatcheries are serving their function by supplying increased numbers of young fishes.

Fish Refuge Production

The principal work in the Upper Mississippi River Wildlife and Fish Refuge has been the construction of propagating ponds at Guttenberg, Iowa, and Genoa, Wis. At both places a considerable quantity of pondfishes was harvested, although the production at Genoa did not reach the level attained during the peak year of 1939. Rescue,

or salvage, crews are no longer needed to gather fish from overflow pools, since relatively stable water levels are maintained. Production of fishes in artificial ponds is required to assure maintenance of the native stock and to provide a supply for stocking other waters.

Cooperation With Conservation Agencies

Continuing contacts were maintained with most of the State conservation agencies, and the principal outcome was the coordination of fish distribution, even to the extent of budgeting the supply of State and Federal fishes and zoning their distribution. Arrangements were made for State participation in the operating responsibility of the Nashua (N. H.) station and for a large part of the production to be available for State disposal.

The exchange of fishes and fish eggs with various State hatcheries is a valuable means of increasing production efficiency, and the distribution by the States of fishes produced at Federal hatcheries is the final step in such cooperative procedure. This practice has now been made effective in Alabama, Georgia, Louisiana, and several other States. Maine, North Carolina, and Mississippi were added to the list of States that review fish applications received by the Service from persons and organizations within their respective jurisdictions.

An interesting example may be cited of the development, in cooperation with the Office of Indian Affairs, of a trout hatchery at Williams Creek, Ariz., within the Fort Apache Reservation. It is expected that part of the production of this hatchery, which is the only Federal hatchery in that State, will be available for waters outside the reservation.

The aquarium, which is located in the Department of Commerce Building at Washington, continues a magnet of public interest, although no material change in its operation or exhibits was made.

Contacts with unofficial sportsmen's groups were largely in the nature of direct services, either informational or in the assignment of fish.

Construction Activities

Difficulties in procuring sites forced further deferment of the authorized hatchery developments in Illinois and New Jersey. A commercial hatchery at Lawton, Okla., was acquired, under authority carried in the 1941 appropriation act, to be devoted to the propagation of warm-water fishes. Some repairs and improvements to the water supply and pond system will be required. Work continued at the following hatchery units: Farlington, Kans.; Hebron, Ohio; New London, Minn.; Salem, Maine; Creston, Mont. (virtually completed); Yellowstone Park, Wyo. (virtually completed); and Austin, Tex. WPA assistance was obtained for the prosecution of several

large jobs involving improvement and enlargement of 25 of the older hatcheries. The Bureau of Reclamation advanced the construction stage of the Winthrop and Entiat units of the hatchery group to be utilized for the Columbia River salmon salvage-program. Work was nearing completion at the main plant at Leavenworth, Wash., although the station has been in active operation.

Cooperative Predator and Rodent Control

In cooperative predator and rodent control, expenditures were made of \$794,000 from departmental funds; \$464,028 from cooperating States, \$1,058,155 from cooperating counties, livestock and agricultural associations, and others, and approximately \$485,839 from emergency funds. The operations resulted in the taking of 122,941 predatory animals, of which 110,495 were coyotes, 1,367 wolves, 10,347 bobcats and lynxes, 528 predatory bears, and 204 mountain lions. WPA projects supervised by the Service supplemented the work in Idaho, Montana, Nevada, Oregon, and Utah. In rodent-control operations 7,700,173 acres of infested lands were treated under direct supervision, and 17,621,729 under general instructions. In cooperative work for rat control, 104,267 infested premises were treated. Equipment and supplies used in predator and rodent control and 1,648,320 pounds of rodent bait materials were distributed to cooperators throughout the country by the supply depot at Pocatello, Idaho.

Control of Predatory Animals

Increased need for protection of meat and wool resources during the national emergency made the control of predators of added significance. The trend toward raising livestock to supplement the one- or two-crop system has increased the demand for assistance in controlling predators to protect flocks and herds. The coyote continued to be the major source of trouble, with bobcats and red wolves next. Depredations by mountain lions, stock-killing bears, and other predators, though severe in individual instances, were localized.

Suppression of predators to check rabies outbreaks.—To check serious outbreaks of rabies in east-central Georgia, 153 foxes were taken under Service supervision within a few months, and of these 61 definitely had rabies. The disease had been transmitted to 237 head of livestock within approximately 6 months. In Luna County, N. Mex., where the spread of rabies to livestock was reported in December, 3 Service hunters removed 130 coyotes, after which the incidence of the disease declined, though hunters were later reassigned to check another flare-up.

Instances of severe predation.—In North Dakota coyotes killed 61 sheep in a flock of 500 during the first 8 days after it was put on a 2,500-acre island pasture in the Missouri River, as well as 25 percent of the 80 fawn deer there; 90 sheep were killed by coyotes in 1 night in Emmons County, N. Dak., and losses to turkey flocks in the same area ran as high as 90 percent. Coyotes killed 50 chickens in 1 night on a ranch near Bluit, N. Mex.; near Aspermont, Tex., within a woven-wire fence enclosure, a coyote in 1 month killed adult sheep and lambs valued at \$500. One male bobcat taken in Pecos County, Tex., had killed 200 lambs and kid goats during the summer of 1940; and bobcats killed 25 goats in 1 night on a ranch near Animas, N. Mex. One Arkansas grower lost 40 goats and 10 sheep in 10 days, and another lost 24 turkeys in 1 night as a result of wolf and bobcat depredations. In 3 months during the fall of 1940, 2 mountain lions killed 11 colts on a ranch in Hudspeth County, Tex.; and on a ranch in Otero County, N. Mex., in February, 1 mountain lion killed 8 colts and 4 calves.

Loss reduction by organized control.—Though livestock and poultry losses from predators have been heavy, especially in western range States, it is encouraging to note a tendency among livestock associations to recognize the need for organized local control in cooperation with the Service and to provide adequate funds to make it successful. These plans entail the assignment of hunters to specific areas and the correlation of control work with year-round movements of livestock on the ranges. Where such programs have been prosecuted, livestock losses have been reduced from about 14 percent to about 2 percent, and growers consider the expenditures for this work one of their best investments.

Typical examples.—A service hunter took 5 adult coyotes and 2 dens of coyote pups from a sheep range in Sioux County, N. Dak., reducing predation from 100 lambs in 1939 to 1 lamb in 1940. Another rancher lost 35 lambs in 1 week before the capture of a female coyote and her den of pups ended the depredations. After 4 trappers took 748 coyotes and 113 bobcats from southwestern Yavapai County, Ariz., goat losses varying from 50 to 250 per band declined to a minimum. The taking of 2 "peg-legged" and 4 normal-footed coyotes in Paradise Valley, Nev., stopped severe predation on newborn calves. Removal of 42 wolves and 2 bobcats from 4 Louisiana parishes stopped severe depredations and permitted recovery in the livestock industry. Capture of 2 wolves that had killed 875 turkeys on 2 ranches near Cedar Creek, Tex., prevented further loss. The taking of 1,147 bobcats, 3,715 coyotes, and 7 mountain lions in 2 counties of Texas, during 4½ years, has brought about livestock protection and contributed materially to an increase of 300 percent in the antelope herds.

Control of Injurious Rodents

Prairie dogs, ground squirrels, kangaroo rats, pocket gophers, other field rodents, and jack rabbits in many sections continued to exact a heavy toll of cultivated crops, forest plantings, and range forage as well as to damage soil-conserving and irrigation structures. In the Eastern States tree-girdling field mice continued to damage orchard trees, nursery stock, and miscellaneous crops. The extent of damage by these rodents is gradually decreasing, however, in areas where the farmers have followed demonstrated control measures. In many sections where forage crops are planted for soil-building purposes, there has been increased demand for control of the pocket gophers attracted there.

The importance of increasing and further safeguarding food, feed, and timber supplies and reducing rodent-borne diseases around military cantonments and elsewhere has given added importance to rodent control. Fieldmen have cooperated with military officials and with State, county, and municipal agencies to reduce rodents in sylvatic plague areas; rats in supply depots and typhus- and plague-infected areas; and pocket gophers on airplane landing fields.

One serious problem in preparing rat baits is the shortage of red squill, which is imported chiefly from Mediterranean countries. In many areas the influx of workers from rural to urban districts has made the rat problem acute, the suddenly overtaxed refuse collection and disposal facilities in cities resulting in accumulations of trash and garbage that provide harborage for rats.

On the Papago Indian Reservation, Ariz., burrowing by kangaroo rats and pocket gophers caused breaks in nine large earthen dams, and a repair bill of \$5,700. The breaks also threatened to destroy the means of livelihood of the Indian farmers, either by prevention of planting or failure of crops due to lack of irrigation water. In many areas in Star Valley, Wyo., pocket gophers have practically destroyed all the alfalfa during the past 2 years. A heavy infestation of prairie dogs on farms in the Nambe Valley, N. Mex., completely cleaned out large areas of growing crops during the summer. On the Nicolet National Forest, Wis., mice were largely responsible for losses on tree plantations. An orchardist near Brooksville, Ky., was forced to replace 17 percent of his trees, which had been killed by girdling. In Delaware, pine mice girdled 20 percent of a planting of 2,500 peach trees. One rat killed 183 chickens in a few nights on a poultry farm near Ogden, Utah, and on one farm in Connecticut rats killed 150 day-old chicks in 1 night.

Effects of organized rodent control.—The benefits derived from trained leadership and organization in rodent control become more apparent each year. Organized rodent control has been inaugurated and

effectively and economically conducted in many areas. After initial control, the system includes maintenance on a patrol basis, with small expenditures for bait and labor. Previously, control in these areas was a hit-and-miss affair, with individual farmers expending vast quantities of bait and labor—only to see their lands become subsequently reinfested from adjoining properties.

Typical instances.—Five years ago some 800,000 acres of grazing lands in Chaves County, N. Mex., were seriously infested with prairie dogs, which were direct competitors with livestock for the forage growth. The organized control has restricted the infestation to 2,000 acres, and relatively inexpensive maintenance is being conducted. Since removal of the prairie dogs vegetation has improved 60 to 75 percent, and many of the ranches are now able to carry 3 to 5 more head of cattle per section. Annual losses of \$1,800 in apple trees through pine mouse girdling in an orchard near Knoxville, Tenn., were checked by application of control measures.

In 1939 the Service cooperated with the Missouri Pacific Railroad Co. in controlling pocket gophers along 66 miles of right-of-way in Texas, where the undermining of ballast required an extra work gang on roadbed repair. Control was obtained within 18 months and riding conditions were improved 75 percent. Now only 6 man-hours per week are required for control maintenance.

Fishery Industries

The commercial fisheries are generally composed of units too small to finance their own industrial research, and varied interests in the fisheries have made it difficult for this industry to form organizations that could conduct such research. The Fish and Wildlife Service has facilities for research and services that serve both the fishery industries and the public interests. These activities promote the conservation of fishery resources by developing more orderly marketing procedures and more complete utilization of raw materials. They aid in marketing more of this healthful food to improve the country's nutritional level, and the resulting records assist defense organizations in buying fish and shellfish more economically and efficiently as well as in food-planning programs.

Fishery Exploratory Investigations

The development of commercial fisheries is replete with instances of the discovery of new fishing areas and the utilization of previously unexploited species. Such development has not only extended outward from our own coasts, but also into the waters off foreign countries. Thus, important fisheries for groundfish are conducted off Newfoundland and Nova Scotia; for tuna off the coasts of the American republics

to the south; for salmon and halibut off British Columbia and Alaska; and for red snapper and groupers off the east coast of Mexico.

The development of new domestic fisheries is particularly important to defense activities, since it results in new food supplies. Exploratory work off the coast of neighboring countries not only results in augmenting the total food supplies of the Americas but improves relations with the neighboring countries.

During the past year the Service furnished personnel for a fishery mission to Peru to conduct economic, technological, and biological studies of the fisheries of that country, the expenses being borne by the Peruvian Government. The survey has disclosed the existence of rather extensive fishing areas off Peru, has studied existing marketing practices, is recommending improvements, and has conducted extensive research on the preservation of South American fishes for food. The fishing vessel chartered for the mission has been purchased by the Peruvian Government and will be used in continued exploratory and experimental fishing. Machinery for manufacturing fish meal and oil also is being obtained.

The fishery exploratory investigations conducted by the Service included studies in the North Pacific Ocean and in Bering Sea of the king crab and its utilization. This work, which was done under conditions as nearly approximating commercial operations as possible, covered studies of the migrations and abundance of this crustacean, the fishing areas, comparative efficiency of various methods of capture, handling and canning procedures, and cost of production.

Fishery Market News Service

From six field offices the Fishery Market News Service disseminates to fishermen, shippers, wholesalers, buyers, and consumers current information on the production and shipment of fishery products and marketing data on supply, demand, and prices. From an office in each of the most important fishing areas, distributing points, and primary markets—New York, Boston, Chicago, Seattle, Jacksonville, and New Orleans—the latest available information is issued in the form of daily mimeographed reports, telegraphic bulletins, and radio broadcasts. Current releases cover about 1,500,000,000 of the nearly 3,000,000,000 pounds of fish and shellfish taken annually for food in the United States and Alaska.

The Fishery Market News Service has been conducted since 1938, long enough to build up a valuable backlog of fisheries data and an experienced personnel capable of supplying the increasing demand for market information. Through summaries and daily releases of production and prices the current day-to-day state of the fisheries is now more nearly known than ever before.

From these records, defense agencies charged with regulating food supplies have been furnished with source, supply, and price data. Surpluses are quickly checked and may be removed, shortages are soon noted and may be remedied, and the results of such actions as the Navy's purchase of 23 New England trawlers may be followed in the daily reports and the effects gaged almost as fast as the vessels are withdrawn from the fishing fleet.

With the Army serving at least two fish meals weekly a new need for information has arisen. Purchasing officers now receive the daily reports in order that they may request bids for sea foods with some knowledge of market conditions, and suppliers have been informed concerning the Army's requirements and Federal specifications. With the aid of trade and other Government representatives, the former Federal specifications for fresh fish have been revised to meet the Army's needs and to conform more closely to present commercial practices. As a further aid to the Army and the industry, a Fish Manual has been compiled that contains information on the more important varieties of fish and shellfish and enables purchasing officers to buy fishery products more wisely and at less expense.

Since most of the market-news offices now have compiled comparative detailed statistics for several years, these data have become increasingly valuable in indicating trends and are of particular use in replying to queries by the trade and in fishery surveys made by other agencies, as the Tariff Commission and the Department of Labor.

Collection and Dissemination of Fishery Statistics

As in former years, fishery statistical activities included the collection and dissemination of data on the volume and value of the commercial catch of fish, shellfish, and other aquatic products; employment in the fisheries and the quantity of gear operated; and the volume and value of the domestic production of manufactured fishery commodities. Surveys to obtain these data were made in all sections of the United States except in the Mississippi Valley.

Statistics of the fisheries are collected to serve two principal purposes—first, to provide conservation officials with information concerning the supply of individual species of fish and shellfish; and second, to supply members of the fishing industry and others with data that will aid in the orderly marketing of fishery products.

Data on the total catch of individual species, the location of capture, the quantity of gear operated, and related information are required by biologists in conservation studies. The most complete figures assembled by the Service to meet these needs are on the landings by fishing vessels at the ports of Boston and Gloucester, Mass., and Portland, Maine. More than 400,000,000 pounds of

fishery products are landed at these ports annually. Information of this production is obtained to show the exact bank on which the catch was made, the gear operated, the length of each voyage, and related information. It is particularly necessary that information of this nature be available during periods of national emergency, when the fisheries may be subjected to unusual strain. Statistics intended principally for economic purposes include those on the catch of individual species; the annual production of canned fishery products, byproducts, and cured fishery commodities; the monthly cold-storage holdings and freezings of fish and shellfish; and the quarterly production of marine-animal oils.

The value of fishery products as human food, and also as raw material for industrial use, makes it particularly important that accurate historical and current information be available. This is especially true during the present period of unsettled world conditions. Fortunately, it has been possible for the Service to conduct regular annual statistical canvasses in most sections of the United States during recent years. The data thus obtained, together with current statistics, have been widely used by various Federal organizations concerned with defense activities.

Investigations To Improve Fishery Technology

Technological investigations of the fisheries are designed particularly for the purpose of developing new methods, and improvements in existing methods, of production, preservation, and general utilization of fishery products. This work is conducted in the Service's laboratories at College Park, Md.; Seattle, Wash.; Ketchikan, Alaska; and Mayaguez, P. R. All these laboratories, with the exception of that at Seattle, were completed during the past year. Laboratory facilities, however, had previously been provided at College Park by the University of Maryland.

Investigations in fishery technology take the form of studies in bacteriology, to improve sanitation in the commercial handling of fishery products; studies of the nutritive value of aquatic products, in order to inform producers, handlers, and consumers of the comparative food values of fishery commodities; studies of preservation of fishery products for food, involving tests for freshness or decomposition, determination of rancidity, improved methods of canning, smoking, salting, refrigeration, or other preservation processes, and the commercial utilization of little-used species; studies in pharmacology, to determine possible toxicity in fishery commodities and its elimination; and in the manufacture of fishery byproducts, involving the utilization of fish waste for manufacture into useful commodities.

Fishery technological investigations include many branches of research. For instance, various methods of evaluating the quality of fresh oysters were investigated, and it was found that this can be judged to some extent by determining the acid content. Several of the more important components of menhaden oil were investigated with the object of utilizing it in more ways than are now practicable. The presence of cholesterol indicated that this oil might lend itself to irradiation to increase the vitamin D content. A proteolytic enzyme or mixture of enzymes taken from frozen rockfish has been isolated and partially identified. Studies were continued to determine the biological value of the protein of crab meat. An investigation is being made dealing with methods of satisfactory preparation of fish for storage in refrigerated lockers. Other technological studies under investigation include development of sanitation tests for fishery products, studies of the nutritive value of alginates from kelp, assays for the determination of vitamins in certain marine-animal oils, production of experimental packs of various fishery commodities, studies of the effect of freezing and temperature of storage on quality, and studies of the utilization of salmon cannery trimmings, factors in fish meal storage, and methods for the determination of fat in fish meal.

Investigations To Improve the Economics of Fisheries

Increasing the consumption of fish was the objective of a market-development program initiated early in 1941. Besides contributing to an improvement in national nutritional standards, this program aids conservation by promoting the efficient utilization of fishery resources. Marketing specialists were stationed in Cincinnati, Columbus, and Pittsburgh to advise retailers as to effective sales practices and handling methods, and to disseminate consumer information relating to fish through radio stations, newspapers, and group meetings. Technical specialists assisted with expert advice on the nutritional values of fish and with recommendations on refrigeration and sanitation in wholesale and retail outlets. Preliminary findings of a study of fish retailing in some 50 cities, begun in 1939, provided a basis for many of the suggestions for store managers. Important features of the program are the provision of market information to all sections of the trade, and recommendations to consumers as to the best buys in sea foods, based on supplies locally available. Another aspect of the program is the likelihood that it will serve as an example to the trade and stimulate widespread efforts to establish fish as a more important item in the national diet.

Continued study of data collected during a survey of fish retailing in some 50 cities has revealed many factors underlying the low consumption of fish. The limited space, equipment, and effort devoted to sale are indications of a general lack of emphasis on fish sales by the average retail store. Relatively few stores employ sales practices that effectively emphasize to the housewife the advantages of serving fish. Added to lack of consumer knowledge prevalent in many inland areas, the existing inadequacies in fish retailing limit the expansion of the fishery industries of the United States and deprive the Nation of full utilization of its aquatic resources.

Game Law Enforcement

Administration of Conservation Laws

The principal Federal wildlife conservation statutes administered by the Fish and Wildlife Service are (1) the Lacey Act of 1900, as amended, regulating shipments in interstate and foreign commerce of wild animals, their dead bodies, or parts thereof, and the importation of live birds and mammals from foreign countries; (2) the Migratory Bird Treaty Act of 1918, protecting birds that migrate between the United States and Canada, as amended to extend its provisions to the treaty of 1937 protecting birds that migrate to and from Mexico, and regulating the shipment of game mammals and parts thereof between the two countries; (3) the Migratory Bird Conservation Act of 1929, authorizing the establishment of bird refuges; (4) the Migratory Bird Hunting Stamp Act of 1934, as amended, to aid in refuge establishment; (5) a law of July 2, 1930, to regulate interstate shipment of black bass; (6) a law (sec. 84, Criminal Code) protecting wildlife and property on Federal refuges; and (7) through the Alaska Game Commission, the Alaska Game Law of 1925, as amended.

Regulatory Action

Changes in the Migratory Bird Treaty Act regulations lengthened the open season on waterfowl, coot, and Wilson's snipe from 45 to 60 days; permitted waterfowl and coot shooting to begin at sunrise instead of 7:00 a.m.; shortened the open season on woodcock to 15 days; reduced the daily bag limit on mourning and white-winged doves from 15 to 12 and on geese from 4 to 3; and increased from 10 to 20 days the time limit for possession of migratory game birds after the close of the open season.

Work of Game-Management Agents

The 44 game-management agents and 23 deputy agents, singly or in cooperation with State officers and deputy game wardens, obtained

evidence in 3,033 cases of game-law violations. Prosecuted in State and Federal courts, these resulted in 2,861 convictions (table 9). Placing game-law enforcement officers in the 62-year-age group retired 3 game-management agents and 1 Alaska wildlife agent. Approval was given in May for the reallocation of game management and deputy game management agents to FCS 11 and 9, respectively. Supervisors of law enforcement were appointed in regions 1, 2, 3, to aid agents and deputies. Educational programs and close cooperation with State game departments have been effective in furthering game protection.

Game management agents in Arkansas, Louisiana, Minnesota, Texas, and California spent \$1,119.09 in under-cover operations under rules approved by the Secretary, and the evidence obtained resulted in 22 convictions, 21 for selling wild ducks and 1 for exceeding the bag limit, and in fines aggregating \$915 and jail sentences of 780 days, with 3 violators placed on probation for 5 years and prohibited from hunting for 1 year.

Apprehensions Under Various Statutes

Migratory Bird Treaty Act cases.—Of 269 pending and 864 new cases, 993 were disposed of with 810 convictions (table 8)—an increase from the preceding year of 35 new cases, 60 terminations, and 144 convictions. Fines, ranging from \$1 to \$750 and aggregating with costs \$20,110, were imposed, with 10 suspended totaling \$217.50. Jail sentences aggregated 2,417 days in 54 cases, and suspended sentences of 1,860 days in 22 and probation terms of 2,340 months in 103.

Migratory Bird Conservation Act cases.—Of 5 pending and 42 new cases, 38 were closed as follows: 35 by convictions, 2 by dismissals, and 1 adjudged not guilty. Fines aggregating \$595 were imposed, and 13 jail sentences aggregating 1,627 days, and in 1 a year's probation.

Migratory Bird Hunting Stamp Act cases.—Of 23 pending and 92 new cases, 93 were disposed of as follows: 2 without prosecution, 7 dismissed, 2 found not guilty, fines aggregating \$512 were assessed in 56 cases, in 4 the fines totaling \$110 were suspended; 3 defendants were each placed on probation for 1 to 5 years, and 19 violators were found guilty but were assessed penalties upon counts charging violations of the Migratory Bird Treaty Act regulations.

TABLE 8.—Cases of violation of the Migratory Bird Treaty Act disposed of during the year and cases still pending on June 30, 1941

Disposed of—	Number	Pending	Number
Convictions.....	810	From preceding year.....	269
Dismissals.....	72	New cases.....	864
Not-prossed.....	45		
Jury trial, not guilty.....	45	Total.....	1,133
Closed without prosecution.....	10	Disposed of.....	993
No bill.....	9		
Closed by death.....	2	Pending at end of year.....	140
Total.....	993		

Wildlife Refuge Trespass Act cases.—Of 19 new and 2 pending cases, 15 were closed, 2 by dismissal and 13 by conviction, with 12 fines of \$145, and a 5-years' probation.

Upper Mississippi River Refuge cases.—Of 17 new and 23 pending cases, 25 were terminated, 20 by conviction, 4 without prosecution, and 1 with no bill; fines aggregated \$95; suspended jail sentence, 3 years and 11 months; and probations, 11 years.

Lacey Act cases.—Of the 13 new cases, 12 were terminated as follows: Convictions in 9 cases, with fines aggregating \$1,040; 1 by dismissal; and 2 failures of the grand jury to return a true bill. Agents making inspections in fur-receiving centers discovered possible infractions of State game or fur laws. Invoices relating to 1,787 shipments of pelts, sent to game-protection officials in the various States, Alaska, and Canada, disclosed 63 law violations, which were terminated in State courts by fines and costs aggregating \$2,072.

Other cooperation with States.—In 43 States 1,829 cases involving violations other than illegal shipments of skins of fur animals were successfully terminated, with fines and costs aggregating \$59,767.10 and jail sentences of 802 days.

TABLE 9.—Summary of penalties imposed during the year for game-law violations

Act	Convictions	Fines and costs	Jail sentences
	Number		Days
Migratory Bird Treaty Act.....	810	\$20, 110	2, 417
Migratory Bird Conservation Act.....	35	595	1, 627
Migratory Bird Hunting Stamp Act.....	82	512	-----
Wildlife Refuge Trespass Act.....	13	145	-----
Upper Mississippi River Wildlife and Fish Refuge Act.....	20	95	-----
Lacey Act.....	9	1, 040	-----
State prosecutions resulting from Lacey Act investigations.....	63	2, 072	-----
State laws, cooperative prosecutions.....	1, 829	59, 767	802
Total.....	2, 861	84, 336	4, 846

Importation and Other Permits

Species Excluded

Among prohibited species detected by importation inspectors and denied entry were 48 skylarks (*Alauda arvensis*), from Portugal; 1 crested myna (*Aethiopsar cristatellus*), from China; 1 chaffinch (*Fringilla coelebs*), from Portugal via the West Indies; and 1 mongoose (*Mungos mungo*), from Africa. Two Oriental bullfinches (*Pyrrhula orientalis*) also were refused entry into Hawaii. Indigo and painted buntings, grosbeaks, and other migratory birds also were intercepted by the inspectors and confiscated for donation to public zoological gardens. Several applications were received for permits to import such birds from Mexico, Cuba, and Central America, sometimes under the guise of canaries, but all such applications were carefully scrutinized and permits refused, except for scientific purposes.

Species Entered Under Permit

The number of importation permits issued was 1,640, including 58 at Honolulu, Hawaii; and 250 importations were inspected.

Birds.—Foreign birds imported into continental United States totaled 89,028, compared with 252,153 last year, the decrease being particularly noticeable in the number of canaries and Mexican quail. Included in the total were 50,128 canaries, 176 parrots, 13,000 Mexican quails, 764 partridges, 185 pheasants, and 24,775 miscellaneous birds. At Honolulu 330 foreign birds were entered, compared with 255 last year.

The principal sources of supply for canaries were Japan and China, whereas previous to the present war, Germany was the main source. Shipments from Europe, except for a few small ones from England, have practically ceased. No Hungarian partridges were imported from Europe, but about 764, raised by breeders, were brought in from Canada.

By decree of November 13, 1940, the Mexican Government established a close season on quail and partridge hunting and trapping in 6 States and the northern territory of Baja California, and prohibited exportation of these birds from any part of the country. On February 15, however, this decree was abrogated to allow hunting and trapping as well as the exportation of not to exceed 75,000 quails from February 15 to April 30. No shipments were made until April, however, and the total number brought in amounted to only 13,000, compared with 85,995 last year. Most of these birds were distributed in Louisiana, Kentucky, Mississippi, Florida, North Carolina, Indiana, Texas, and New York, with small lots to five other States.

Importations of parrots (176) show a slight increase over last year (125), and these birds also continue to be subject to the regulations of the Public Health Service, in addition to those of this Department.

Other interesting importations were 1 snow-white bell bird (*Chasmorchynchus niveus*) and 1 Brazilian eagle (*Hypomorphnus urubitinga*), from Brazil; 1 quetzal (*Pharomacrus mocinno costaricensis*) from Panama; 1 fish-eating hawk (*Gypohierax angolensis*), 1 yellow-casqued hornbill (*Ceratogymna elata*), 1 West African goshawk (*Accipiter tachiro macrocelides*), and 1 South African scaup (*Nyroca erythrophthalma*), from Africa; and 11 Formosan tree partridges (*Arborophila crudigularis*) from Japan.

Mammals.—Importations of black bear cubs from Canada numbered 91, compared with 92 last year. Rhesus monkeys, imported as usual chiefly for experimental purposes, totaled 8,655, compared with 10,146 last year. Among the more interesting mammals were 1 female gorilla "Toto," imported via Havana, Cuba, from French Equatorial Africa, where she was captured when about 2 months old and weighing about 9 pounds—this gorilla was brought in by one of the large circuses as a mate for a male, "Gargantua," which had been imported in 1933 from the French Cameroons; 2 hutias (*Capromys prehensilis pilorides*), from the Dominican Republic; and 1 giant pouched rat (*Cricetomys gam-*

bianus liberiae), 1 West African brush-tailed porcupine (*Atherura africana*), and 1 colobus monkey (*Colobus occidentalis*) from Africa.

Permits Under the Migratory Bird Treaty Act

For scientific purposes.—To take migratory birds or their eggs for scientific purposes, 571 permits (general or under specific limitation) were issued and 1,722 were outstanding at the close of the year. Permits to possess migratory birds or their eggs lawfully acquired were issued to 46 persons, and the total number outstanding at the close of the year was 610. For possession of specimens found dead, 141 permits were issued, and for banding migratory birds, 131.

For propagation.—Permits to take migratory waterfowl for propagation were issued to 24 persons, and to possess birds lawfully acquired, to 312. At the close of the year 4,100 propagating permits were outstanding. Reports by permittees disclose that 3,426 wild geese and 79,121 wild ducks were raised in captivity, of which 74,455 were mallards, 3,242 black ducks, 869 wood ducks, 207 pintails, and the remainder principally teals, ringnecks, gadwalls, baldpates, redheads, and canvasbacks. From propagating stock, 5 swans, 258 mourning doves, and 20 band-tailed pigeons were produced. Of propagated birds, 16,906 ducks, 227 geese, and 223 mourning doves were liberated.

For depredation control.—To enable permittees to protect crops, fish, and other property from serious depredations by migratory birds, 470 permits were issued. Investigations by field agents of many complaints of depredations afforded relief without the issuance of permits.

Permits Under Other Acts

For collection in Alaska.—Permits authorizing the taking of birds and mammals in Alaska were issued to 25 persons.

Eagles.—One scientific-collecting permit was issued to a public museum under the Bald Eagle Act.

Bait permits.—Fifteen permits were issued under an act of Congress to take small fish from the waters of the District of Columbia to use as bait.

Whaling Treaty Act.—With whaling reduced to the lowest level for many years by war and other conditions the only license issued was for a shore station and one catcher boat on the California coast, for which the Treasury received a fee of \$1,000. A statistical report was prepared and forwarded to the International Bureau for Whaling Statistics at Oslo, Norway, as required by the treaty.

The total number of all permits issued and outstanding is approximately 12,200.

Alaska Fish and Wildlife

Fishery Resources

ALASKA FISHERY INVESTIGATIONS

Under authority vested in the Secretary of the Interior by the White Act (43 Stat. 464), this Service is responsible for the conservation and regulation of the fishery resources of Alaska. In fulfillment of this responsibility, continuous scientific investigations are conducted to gain basic knowledge of the factors causing annual and periodic fluctuations of fish stocks. The results are translated into prac

tical management measures. Studies undertaken over a long period have added to the fund of information useful for practical fishery management and have made significant contributions in the field of pure biological science.

Bristol Bay red salmon.—The size, age, and condition of the seaward-migrant red salmon fingerlings were determined in each of the five main watersheds, and the age, sex, and condition of adults taken by the commercial fishery were determined from analyses of 12,750 samples obtained. Abundance and distribution on spawning grounds were studied by ground and aerial surveys of the 35,000 square miles of watershed within the Bristol Bay region. Special attention was given to spawning escapement at Brooks Lake, where a weir was operated for the first time. The migration routes of adult red salmon prior to and during the fishing season, in the waters of Bering Sea as far west as the Islands of Four Mountains and northward to Nuni-vak Island, were charted with the aid of two large purse-seine vessels. Hydrographic studies were made in this area by aid of the cutter *Redwing* through cooperation of the United States Coast Guard.

Karluk River red salmon.—Weekly collections of egg samples denoted that egg production by individual red salmon of equal size is about 20 percent greater in September than June. Morphometric data were obtained on 639 red salmon for studying possible racial differences between early and late components of the Karluk River run. Analysis of stomach contents of 5,000 Dolly Varden trout indicated that no increase in the abundance of red salmon could be expected at Karluk by trout eradication.

Pink salmon.—Completion of a permanent laboratory at Little Port Walter makes year-round investigations of the salmon resources of southeastern Alaska possible for the first time. An essential feature of the station is a counting weir for enumerating seaward-migrant salmon, 3,402,830 young of which were thus counted during the spring. Tagging pink salmon indicated that in certain years the species may almost completely change its routes of migration among the islands on the way to the spawning streams.

Herring.—A marked decline in abundance of herring in the Kodiak and Prince William Sound areas was noted through analysis of records of catch per unit of fishing gear. In Kodiak the 1940 index was 0.67 compared with 0.97 in 1939 and 1.05 in the peak year 1938. In southeastern Alaska, the limited fishing activity of 6 weeks beginning on August 30 was a total failure, for no herring were captured. The decline of herring abundance at Kodiak and Prince William Sound was not due entirely to a too intensive fishery, but to the failure of the 1932, 1933, 1934, and 1937 year-classes to develop successfully. These deficiencies in increment, together with the decline in abundance of the 1931 year-class, which had supported the fishery for the previous

6 years, resulted in the reduced population levels noted. Regulations designed to restore the herring supply were adopted.

ADMINISTRATION OF FISHERY LAWS AND REGULATIONS

Upon the broad principles laid down in the Fisheries Act of June 6, 1924, whereby the Department is vested with full authority and responsibility for regulating the time, place, and method of commercial fishing in Alaska, the Fish and Wildlife Service continued its established program for the protection and conservation of the fisheries to assure a maximum stabilized yield. The Director and other officials were in Alaska for several weeks giving personal attention to problems pertaining to management of the aquatic resources. After the close of the fishing season, public hearings were held at seven places in Alaska, and at Seattle, Wash., to obtain the views of the industry with regard to fishery regulations.

The revised regulations, issued on February 28 for the 1941 season, included adjustments in the seasons of Cook Inlet and several districts of southeastern Alaska to protect anticipated small runs of pink salmon. In the Prince William Sound area and the Icy Strait and western districts of southeastern Alaska the regulations contemplated voluntary curtailment of fishing intensity to prevent too severe drains on expected small salmon runs, and an amendment was subsequently issued closing 48 trap sites voluntarily surrendered for the 1941 season by operators. There was also a corresponding reduction of purse-seine fishing. As the herring populations of the Kodiak, Prince William Sound, and southeastern Alaska areas show evidence of depletion, severe restrictions on herring fishing were continued.

Vigilant control over the fishery resources is necessary to prevent unwise exploitation in the period of national emergency, when current market demands stimulate increased operations. The Department's regulations must provide for a sustained yield so that a prolonged emergency period will not find the Nation lacking in essential fishery products.

In the patrol of the fishing grounds 13 vessels of the Service, 8 speed boats, and a number of other small power boats were used in 1940, effectively supplemented by the use of airplanes, both Government-owned and chartered. The personnel identified with fishery protective work numbered 192, including fishery-management agents, stream guards, weir operators, vessel crews, and biologists. In addition, 14 wild life agents were deputized to this work by the Alaska Game Commission. Reciprocal cooperation by fishery law-enforcement officers likewise improved the patrol for the protection of game and fur animals.

Throughout the season careful observations were made of the extent and condition of the salmon runs and escapements, for the purpose of initiating appropriate modifications of the fishing regulations. The unusual lateness of some of the pink-salmon runs resulted in a heavier than ordinary seeding of certain spawning areas.

Some work was accomplished in removing stream obstructions that blocked the passage of salmon to spawning grounds. The improvement of conditions for the natural reproduction of salmon included also the destruction of predatory Dolly Varden trout in important red salmon streams in the Bristol Bay and Cook Inlet areas. The Territorial Legislature at its 1941 session did not appropriate funds with which to continue this work.

Scientific investigations of the salmon and herring were continued, and some further study was made of the salmon-Dolly Varden trout relationship in the Kodiak area. Weirs for counting the escapement of spawning salmon were operated in 11 representative salmon streams.

PRODUCTS OF THE FISHERIES

The total output of Alaska fishery products in 1940 was 323,507,000 pounds, valued at \$36,441,000, compared with 368,536,000 pounds, valued at \$40,104,000 in 1939. The estimated value of the 1940 catch to the fishermen was about \$10,612,000, or about \$709,000 less than in the preceding year. The number of persons employed in the various branches of the fisheries dropped from 30,572 in 1939 to 25,199 in 1940.

Salmon products represented about 81 percent of the weight and 91 percent of the value of Alaska fishery products in 1940. Ninety-three percent of the salmon products consisted of canned salmon, the pack amounting to 5,069,343 cases, or 243,328,464 pounds, valued at \$31,474,492. Red salmon comprised 19 percent and pink about 58 percent of the total pack, as against 37 and 48 percent, respectively, in 1939. Compared with the pack in the preceding year, the output of canned salmon in 1940 showed a decrease of about 4 percent in quantity and 9 percent in value. One hundred canneries were operated, 9 less than in 1939, and the number of persons employed decreased from 24,921 to 19,666.

In the herring industry, 7 reduction plants that had operated in the previous year were closed in 1940, but a number of additional small salteries made a total of 24 herring plants operated, as against 21 in 1939. The products of the herring fishery were valued at \$1,258,071, a decrease of about 40 percent from 1939.

Halibut landings of the Alaska fleet increased 25 percent in quantity and 61 percent in value over 1939, and several of the minor

fishery products, including clams, shrimps, and crabs, also showed a gain over the previous year.

Pribilof Fur Seals and Blue Foxes

Sealing on the Pribilof Islands and the incidental foxing operations were carried on by the natives under supervision of Service employees, and during the summer approximately 80 additional native laborers from the Aleutian Islands were employed. At the fur-seal byproducts plant on St. Paul Island there were produced about 24,400 gallons of blubber oil, 6,200 gallons of carcass oil, and 309 tons of meal. Except for the carcass oil, which was retained on the island for experimental use in road work, and about 24 tons of meal, used for feeding fish at hatcheries, these products were sold at Seattle through competitive bidding.

Annual supplies for the Pribilofs were shipped from Seattle on the U. S. S. *Vega*, through the cooperation of the Navy Department. The Coast Guard also cooperated in patrolling waters of the North Pacific Ocean and Bering Sea for the protection of fur seals and sea otters.

In accordance with the terms of the fur-seal treaty of 1911, delivery of 9,789 sealskins, or 15 percent of the season's take, was made to the Canadian Government. Japan continued to receive its 15 percent share from the proceeds of sale of the remaining skins.

SEAL HERD

The estimated number of animals in the Pribilof Islands fur-seal herd as of August 10, 1940, was 2,185,000. This is an increase of 164,362 over the computed number in the preceding year. The take of skins in 1940 was 65,263, or 4,790 more than in the preceding year. Effort was made to limit the killings to 3-year-old males and a sufficient reserve of this age class was made for breeding stock.

SALE OF SEALSKINS

In the fiscal year 1941 two public auction sales of fur-seal skins were held at St. Louis. At the September sale 31,029 sold for \$649,018.25. The sale included 10,144 skins dyed black, 10,314 matara brown, 10,329 safari brown, and 242 raw and partly processed. In addition, 210 sealskins allotted to the United States by the Japanese Government in 1939 were sold for \$3,011. At the March sale, 33,118 skins sold for \$979,903.50. This sale consisted of 9,968 dyed black, 13,175 matara brown, and 9,975 safari brown. Sealskins disposed of at private sales under special authorization by the Secretary consisted of 4 dyed black, 192 matara brown, and 2 logwood brown, which brought \$4,861.94. In all, 64,345 sealskins were sold for the account of the Government for a total of \$1,633,783.69.

SEALSKINS TAKEN BY NATIVES

Under provision of the North Pacific Sealing Convention of July 7, 1911, aborigines dwelling along the Pacific coast may continue to hunt fur seals by primitive methods. In 1940, 65 sealskins were thus taken by Indians under the jurisdiction of the United States and duly authenticated by Government officials, of which 29 skins were taken off the coast of Washington and 36 off the coast of southeastern Alaska. No sealing was carried on by Indians of British Columbia in 1940.

BLUE FOX MANAGEMENT

The care of blue foxes on the Pribilof Islands is incidental to sealing activities. In the 1940-41 season 651 fox skins were taken, of which 169 were from St. Paul and 482 from St. George. There were sold at public auction 1,246 blue and 12 white fox skins taken on the islands in the 1939-40 season. The blue pelts brought \$16,247, and the white pelts, \$108, a total of \$16,355.

Wildlife Research

Field investigations were continued on the Matanuska-Susitna Valley range, and a wildlife survey was begun to provide information for measuring the effects of settlement and to plan for future wildlife development. A study is progressing on the Dall white sheep, about 600 of which are in an area of 400 square miles in the Mount Hayes region. Particular attention is being given to the relationships of the wolf, man, and other factors in the maintenance of a desirable wildlife balance in occupied areas, and to correlate the investigations with similar studies being conducted in Mount McKinley National Park.

Game and Land Fur-Animal Management

ENFORCEMENT OF ALASKA GAME LAW REGULATIONS

The regulations approved for the 1941-42 season under the Alaska Game Law prohibit the taking of game animals within half a mile of any highway or the Alaska Railroad; reduce the limit on grouse and ptarmigan to 10; prescribe a closed season on beaver in fur districts 1, 2, 3, and 8, and a limit of 10 in districts 4, 5, 6, and 7; and continue the closed season on marten.

Two 4-place airplanes were purchased, one a seaplane with headquarters at Ketchikan for use throughout southeastern Alaska, the other, which operates on either skis or wheels, stationed at Fairbanks. Another plane is used in the Anchorage district.

Eleven Alaska wildlife agents investigated 224 cases, 21 of which involved aliens, and closed all but 3. Of 141 persons prosecuted before United States commissioners, 2 were acquitted and 139 were fined a total of \$5,115, sentenced to 1,590 days in jail, and relieved of contraband valued at \$12,788. The seizures included pelts of 3,204 muskrats, 322 beavers, 141 minks, 70 foxes, 30 land otters, 16 martens, 9 brown and grizzly bears, 5 wolverines, 2 lynxes, 4 ermines, 1 black bear, and 2 sea otters; 60 ducks and 6 geese; and 2,743 pounds of deer and moose meat. Other contraband seized included 43 guns, 35 pounds of eider down, 28 licenses, 17 traps, 2¾ ounces of strychnine, and 3 mountain sheep heads.

During March the Fairbanks airplane was flown 3,500 miles in the Lower Yukon, Koyukuk, and Kotzebue areas, during which an alien who had been operating for several years under a resident fur-dealer's license was apprehended and taken to Nome, where he was fined \$1,000 and his furs valued at \$1,400 forfeited. Visits also were made to fur dealers who have been known to traffic in early caught and unprime furs, and 2,500 unprime, fall-caught muskrats were seized from one. Aside from the speed and facility with which patrol trips can now be made, the element of surprise appearance is of great value. Illegal traffic in furs has been made more difficult by the enlargement of air patrols. In southeastern Alaska, where weather conditions are sometimes unsuitable for flying, the effectiveness of combined plane and boat patrols was thoroughly demonstrated. On a reconnaissance flight in the vicinity of a closed area, when smoke from a trapper's camp was sighted and weather conditions prevented a plane landing, a patrol boat was directed to the area; on the following day the violators were taken before a United States commissioner and fined \$100 each.

RESTOCKING PROJECTS

The herd of 8 elk introduced on Afognak Island by the Alaska Game Commission in 1927 has increased to more than 150. During a spring survey, made just as the migration began from winter to summer ranges, a wildlife agent counted 147 elk, all apparently in excellent condition: observed their feeding habits; and studied types of the vegetation being used as food. The herd disappears from summer ranges late in October or early in November and returns from the sheltered areas of the interior about the first of April. The habitat they have chosen furnishes winter and summer grazing areas sufficient to support a herd of many times the present size. Poaching has been practically eliminated by periodic patrols, and there is no evidence of molestation by bears.

Approximately 100 Mongolian pheasants, hatched at the Petersburg Experimental Fur Farm, were liberated in the Wrangell district, and a

small lot of Mongolian, Cheer, and Reeves pheasants were liberated on the Kenai Peninsula in an effort to determine which species would best withstand winter conditions there. In addition to experiments with the Mongolians, 16 pairs of Nepal Kaleege pheasants, supplied by cooperation of the Wisconsin State Game Farm, are being studied at the Territorial fur farm at Petersburg.

Other restocking projects undertaken by the Alaska Game Commission are progressing satisfactorily. The 19 buffaloes introduced into the Big Delta region near Fairbanks in 1928 have increased to about 200. Reports from Nunivak Island indicate that the musk ox herd brought from Greenland via Norway in 1930 has increased to about 100. The 18 mountain goats transplanted from the mainland near Juneau to Baranof Island in 1925 now form several bands aggregating about 200. Beavers, muskrats, and snowshoe hares liberated on Kodiak Island in 1925 and 1934 are increasing rapidly.

PREDATOR CONTROL

A predator-control agent stationed in the Norton Sound areas studied depredations by wolves on reindeer herds and instructed natives in trapping methods. Stationing a wildlife agent on Kodiak Island has facilitated investigations of complaints of cattle destruction by brown bears and lessened the bear-cattle controversy, stock raisers having begun to realize that losses from the bears are not nearly so extensive as was at first feared.

Although the coyote is comparatively new to Alaska, having followed the white man over the old gold-rush trail, attracted probably by the hundreds of dying horses, it is now well established in every section of the mainland. It preys upon various kinds of fur animals as well as waterfowl, ptarmigan, and grouse, both by destroying nests and by killing. Its food habits are similar to those of the fox and of many other fur animals, and the resulting competition for food and the killing of fox pups prevents the increase of these valuable species to the extent that would otherwise be possible.

The wolf, however, is a native of Alaska, but in recent years has been increasing in numbers in the reindeer areas and causing serious losses in the herds. Its depredations on mountain sheep, deer, moose, and caribou are on both adults and young, whereas those of the coyote are confined principally to the killing of fawns and lambs. Despite this, however, the coyote is the greater menace, because whereas the killing of a single adult game animal or reindeer provides the wolf with several meals, the coyote to obtain the same quantity of food kills many more of the young.

The success of the reindeer industry, as well as the future of the fur and game supply, depends to some extent on the control of both

coyotes and wolves. The representatives of the Fish and Wildlife Service and of the Alaska Game Commission therefore appeal to all trappers to equip themselves with suitable traps, snares, and scent materials to help in the control of these predators. In many Eskimo villages visited by officials, the idea prevails that wolves are hard to trap and that it will be only a matter of time before they extirpate the reindeer, after which they will leave. Official participation in control is therefore chiefly educational and is limited to the instruction of natives and other private trappers, distribution of scent materials and trapping equipment, and to a general study of the problem.

Japanese Activities in Bering Sea

The floating plant *Kosei Maru*, with auxiliary craft consisting of 9 trawlers of 100 tons each, was engaged from May to August 1940 in taking halibut and cod in Bering Sea about 100 miles northeast of the Pribilof Islands, with 1 additional trawler during the last week or two of the season. The vessel was reported to have left for Japan toward the end of August with a capacity cargo of frozen halibut and frozen and salted cod.

This is the eleventh consecutive year that Japanese floating plants have operated in these waters, the number of vessels having varied from one to four, with the usual complement of tenders. Practically all operations have been confined to the taking of crabs for canning and to trawling operations for cod, flounders, and other bottom fish for manufacture into oil and meal. Since the arrangement in 1938 whereby the Japanese Government agreed that it would not license vessels to take salmon in Bristol Bay waters, there has been no indication of salmon fishing.

Office of Indian Affairs

JOHN COLLIER, Commissioner

IT MAKES a great deal of difference these days how the American people and their Government deal with the Indians. The democracy of a country can be judged to a large degree by the attitude of the public toward minority groups. The President in the opening address before the White House conference on children in a democracy on April 26, 1939, said, "The success of democratic institutions is measured not by extent of territory, financial power, machines, or armaments but by the desires, the hopes, and the deep lying satisfactions of the individual men, women, and children who make up its citizenship."

The Indians of the United States constitute a significant minority group—significant in the first place because they were once the possessors of the American continent and therefore represent in a way a conquered race—significant in the second place because their culture, their values, their traditions have much to contribute to the improvement of American civilization. The Indians are a sturdy people, clinging tenaciously to their customs, their languages, and their group and tribal life.

Much of the history of White-Indian relations is anything except a matter of pride, viewed in the light of our democratic heritage. It has savored too much of the spirit being manifest on every hand these days by conquering nations. Thus, at a time when our faith in democracy and in democratic institutions is being sorely tried and tempted, the spotlight will be increasingly focused upon American treatment of minority groups. It is therefore most encouraging to note the growing awareness on the part of the public of the existence of the Indian group and the increased determination by Government officials as well as by members of Congress that these people shall be given opportunities adequate to compensate for their social and economic handicaps.

The administration of native minority groups is a problem with which governments have been grappling for centuries. In no place,

either in the Americas or in colonial administration, has the problem been clearly defined and analyzed and the procedures formulated. The experience of the United States in Indian administration therefore may prove a significant contribution to the whole question of minority groups within a democracy.

The Indian problem grows out of the necessity for the Indians continuously to adjust their culture and ancient social forms to modern technology and to modern scientific programs of conservation, health, and education. It stems from the clash of primitive economies with the highly organized processes of production and distribution of our present-day society. It is irritated by the ever impinging white culture threatening to uproot and cast out the concepts rooted in centuries of habits, experience, and traditions. We now thrust upon the already perplexed and confused Indian the problem of playing his role in the country's effort to arm and defend itself from the encroachment of the totalitarian States, expecting somehow that he too will be able to understand the clash of ideologies that form the leaven of the conflict.

The problem facing the Indian is in its essence a world problem and one which must be solved if there is to be achieved any ordered stability in the international and internal relations of States. It is the problem of reconciling the rights of small groups of people to cultural independence with the necessity for larger economic units demanded by modern methods of mass production and distribution. This has been at the very heart of Indian policy since 1933, and in many respects the object of severe criticism by many friends of the Indians. The rights of the Indian to cultural independence have been seldom recognized by Indian policy, but rather there has prevailed the totalitarian concept of a super race dominating, absorbing, and reducing to serfdom the small minority groups of a different culture.

In the recognition of the rights of Indians to cultural independence present-day policy has not lost sight of the fact that this right must be reconciled with the demands for adjustment to modern technologies.

Essentially the Indians are a rural people and services in their behalf have had to be aimed at their economic rehabilitation, largely through various forms of agriculture, forestry, livestock and other uses of natural resources. Studies conducted during the past four years of graduates of Indian schools show unmistakably that the majority of Indian young people upon completion of their schooling either remained at home permanently or returned there within a short time after graduation. Even the young people who had been trained in vocational and industrial pursuits as a rule did not pursue their trades, but found their way back to their home communities. The depression and the continuing unemployment in skilled trades and other forms of wage work made it extremely difficult for young

Indians to secure employment in cities. Hence, it became the policy of the Indian Service to make available to Indians every possible opportunity to secure a livelihood through the use of reservation resources.

This policy found expression in a program characterized by land acquisition and consolidation; extension of credit facilities; conservation of soil and moisture; education of Indian youth in the intelligent use and conservation of their resources, and by other activities designed to conserve, enlarge and properly to use the natural resources of the Indians.

These efforts toward economic adjustment of the Indians on the land and the conservation of their resources are now being supplemented with programs to aid the Indians in taking their part in the defense program.

Schools which have devoted practically their entire efforts to agricultural training are now including training in skills more directly related to defense. Some Indians who have been aided in establishing themselves in agricultural enterprises are now leaving their farms and enlisting or finding employment in defense projects. Reclamation projects designed to provide economic rehabilitation for Indian groups whose resources are inadequate are being temporarily shelved or slowed down. Every effort however is continuing to be made to carry on the policy of conservation of natural resources.

The role of the Indian Service in the defense program may be thought of under the following categories:

1. Cooperation with selective service agencies in the registration of Indians and the stimulation and encouragement of Indian young people to perform their proper role in defense efforts.

2. The discovery and placement of skilled craftsmen in civilian defense preparation.

3. The broadening and intensification of trade and industrial training through the Indian's schools and through the Indian CCC.

4. The conservative but efficient use by the Indians of their resources in the production of food, oils, needed minerals and forestry products.

5. The development of a broad program of adult education aimed at the removal of illiteracy, the creation of a more intelligent understanding of institutions of democracy, the improvement of nutrition and health habits, the conservation of health, and the building of an adequate home defense.

6. The continued but sharpened emphasis upon training Indians in practical democracy through increased participation in self-government.

7. Cooperation with other American countries by the interchange of information, experience, and research projects in the field of Indian administration.

Indians Serve as Soldiers

During the last World War a majority of the Indians were not subject to the draft. Large numbers of them volunteered and scores distinguished themselves by outstanding service. Since that time, however, Congress has by special enactment granted citizenship to all American-born Indians so that now they are all subject to selective service. This ruling has been upheld by the United States district courts.

In view of the long period of strained relationships between Indians and the Government it is heartening that everywhere and in every tribe the Indians have responded willingly and gladly to the opportunity to share in the defense of the country. Not only have they registered for Selective Service, but some 700 or 800 of them have volunteered, while over 1,000 have been inducted through their National Guard units.

In one jurisdiction more than a fourth of all those eligible for service have either volunteered or are serving with the National Guard. In another jurisdiction, nearly half of those of draft age are already in camps. In 70 percent of all the reservations the number of Indians volunteering through enlistment or their National Guard has exceeded the number drafted. At the close of the fiscal year more than 3,000 were in the armed forces.

Every evidence is that the Indians are making excellent soldiers. Their traditions of scouting and quick movements fit admirably into the newer military tactics which place a premium upon mobility.

Many of those enlisting have had excellent training in Indian schools and in the Indian CCC and have advanced rapidly in grade. They are able to operate and repair trucks, tractors and heavy road machinery, and to install radio and telephone equipment, and to do such work with a minimum of supervision. Their training makes them invaluable to the military service.

Indians in Defense Industries

Many of the Indians are highly skilled machinists and mechanics, and are playing a leading role as civilians in defense preparation. Mohave Indians at Needles, and Laguna Indians at Winslow have for years handled some of the most important assignments in the shops of the Santa Fe Railroad. With the increased demands being made upon the railroads by defense activities these Indians are rendering outstanding service. Others are being employed in Army construction projects.

At Fort Wingate, N. Mex., for instance, where the Army is building a multi-million dollar plant for storing munitions, there are approxi-



INDIANS AID IN DEFENSE

Fashioning of weapons swifter than their forefathers' flaming arrows is included among the defense training courses undertaken by Indian youth. Here, a young brave of the Caddo-Delaware tribe of Oklahoma, demonstrates electric welding on an Army bomber at Haskell Institute, Kansas.

mately 1,500 Navajo employed on the project, which is about one-third of the total number employed, including office workers and supervisory personnel. Over 50 percent of the unskilled laborers are Navajo, and there are 150 Navajo in semiskilled and skilled positions. The Indians draw the same wages as anyone else for comparable work.

Army authorities and representatives of the contractors supervising the work have been unqualified in their praise of the Navajo, stating that they are better workers than any other laborers they have had to work for them.

In addition to performing unskilled labor, the Navajo on the Fort Wingate project are tying steel, building forms, finishing cement, driving trucks, and acting as foremen of Indian groups. Promotions are coming steadily. These Indians seem to sense the importance of their new jobs, and are proud of their photographs and identification buttons which they keep meticulously shined.

Army officers and contractors of the project wonder where so many of the Navajo workmen learned to operate tractors and trucks, and to perform skilled work of carpentry and stone masonry. The answer is that the schools and the Civilian Conservation Corps program on the reservation for the past 8 years has enabled many Navajo to learn these occupations.

Schools Adjust Curricula to Defense Needs

The year has seen a great change in the student enrollment in many Indian Service boarding schools. In a number of centers many of the students were members of the National Guard and were called into training. Other Indian students were early volunteers, and still others have been drafted. The success of the Indian schools' training courses in electric welding, various other phases of metal work, and quantity cooking and baking has been such that practically all graduates of these courses have been rapidly absorbed into industry and, in many instances, students in training have been induced to enter industry before the completion of their courses because of their excellent grounding.

Steps have been taken in a number of Indian schools to emphasize training which bears a direct relationship to national defense. This has appeared particularly appropriate at certain of the nonreservation boarding schools located in areas adjacent to growing defense industries. There has been close collaboration with the CCC-ID which has designated certain schools for specialized training in radio, mechanics, and tractor and diesel operation. Indian Service schools and agencies as well as CCC camps have been designated by the

United States Commissioner of Education as centers for defense training. They receive additional equipment and teaching staff from the special defense appropriation which is being distributed through State boards of vocational education. Indian Service boarding schools are encouraging older, out-of-school students to return for specialized defense training or for retraining. Educational loans are being extended to many of these students. Work scholarships are also being made available.

An instance of the modification of schools programs to meet defense needs is the work of the Chilocco School in Oklahoma. This is primarily an agricultural school, aiding young Indians of Oklahoma and Kansas to learn to manage their farms and to make efficient use of their lands.

To contribute to defense needs, the school on March 28, 1941, offered a course in aircraft sheet-metal work. The first group of 20 students completed the work on May 29, and on July 15, 18 of them were employed in the airplane factories of Wichita, Kansas. The second group of 20 will have completed the course and a third group enrolled before the publication of this report.

Haskell Institute, in Lawrence, Kans., a trade and commerical training school for Indian youth, has pointed much of its work toward training for defense industries. To date, 61 of its students have entered aircraft and related industries.

All of the schools which have personnel and equipment are increasing their work in sheet metal, drafting, radio and telephone communication, acetylene and electric welding, forging, automotive mechanics, Diesel engine operation, and tractor operation and repair.

To these schools are coming scores of young men—previous graduates—who have been living in their communities and have not had opportunities to practice their skills, to take brush-up courses and revive their lapsed skills. They are being quickly placed after short intensive retraining courses.

Much of the defense training is being carried on in cooperation with the National Youth Administration, the Office of Education, and the local and State administrators of defense education.

Many Indian youth are also entering trade-training courses given by public and private schools. The Mission Agency in California reports 88 of the young people of that jurisdiction enrolled in courses in welding, metal trades, heavy equipment operation, etc., conducted by the public schools of the State.

Participation of Indians in defense efforts is not restricted to those who need the income. Seven Osages are enrolled in the aircraft sheet metal course at Chilocco, another 7 are known to be working in defense connected industries, while 14 others are taking private courses in aviation at their own expense.

Incidentally, 21 Osages have enlisted voluntarily, and 11 have been inducted under Selective Service.

This increased emphasis upon industrial training is somewhat at variance with the program of agricultural training and education in rural living which has characterized the program of the last 5 years. The majority of Indians live in rural areas and possess important basic resources suited to agriculture or stock raising. In its agricultural training, each school seeks to give the student an actual economic return in proportion to the effort which he expends. The school furnishes land and seed for farm and garden projects, and loans the student tools and equipment. When his crop is harvested, he pays back to the school a reasonable portion of the crop as rent for equipment and land, and payment for seed, fertilizer, and other commodities. The student receives the remainder in accordance with his contract. This share might be in the form of crops or of the cash received from the sale of crops. The income from the student's share is deposited to his account and is paid to him upon graduation to be spent for further training or used to equip in part, and operate his own, or his father's farm.

Livestock training has been placed upon a similar basis. The student acquires ownership of livestock in return for labor performed with the school stock, or on a repayment basis by which the student pays for the stock by a return to the school of the first female issue. The students are encouraged to retain and care for such stock to form a nucleus for a herd of cattle, sheep, or goats, or as the basis of a poultry flock, or other livestock venture.

Many Indian schools lack sufficient land to permit the carrying on of such practical projects. In 1932 there were 43,670 acres of school land. It was used primarily for production of food for the schools, or leased to non-Indians. In 1940 this acreage had increased to 117,737, and practically all of it was being used by Indian youth in practical agricultural or stock raising projects. To sponsor this program, the number of agricultural teachers in Indian Service schools has increased from 7 in 1935 to 58 in 1940.

As a result, the number of students engaged in agricultural enterprises in the schools has tripled within the past 4 years.

Approximately 7,000 head of cattle have gone into the hands of young Indians during the past 3 years under this program. Some of these have become incorporated in their parents' herd, some have been used as a basis for starting herds of their own, some undoubtedly were slaughtered for family use, and some sold. Similar success has attended the farm and garden projects where children individually or in collaboration have operated from 1 to 80 acres of diversified farming.

Responsibility for the placement of students graduating from

vocational courses in Indian schools has been increasingly placed upon the vocational instructors. As a result they are continually modifying their instruction, more effectively to meet the demands of the labor market.

A follow-up survey is made of the graduates of the various schools to see which ones have entered industries, which ones have returned home, and how successfully they are following their vocation. These surveys have resulted in a continuing revision of the school curricula in the light of employment opportunities.

Each year a selected group of young Indian college graduates are offered apprenticeships in teaching in Indian schools. The plan, entering its fifth year, is proving increasingly successful in recruiting young Indians of great promise.

The summer programs of in-service training, offered by the Education Division since 1936, are continuing to attract large groups of teachers who wish to improve the quality of their instruction. A recent informal study revealed that approximately 90 percent of the Indian Service teachers receiving promotions during the last 5 years had attended two or more of these in-service training sessions. Whether the teachers attracted to summer schools are the better teachers, or become better teachers because of summer school attendance, is not wholly clear but the fact remains that the quality of educational service has been raised as a result of the summer programs.

During 1940 and 1941 the Navajo-English bilingual texts which have been in preparation for some time were in use in two of the Navajo Service boarding schools. Great success in teaching young Navajo to read their own language is reported and some progress has been made in developing the ability to write Navajo. This is naturally a more difficult step in the process and in the absence of a published dictionary of the Navajo language will naturally be a slower development. Because of the enthusiasm with which these bilingual books have been received, increased attention has been paid to the preparation of further reading material in the Navajo language. The Dakota Sioux have expressed great interest in the teaching of the native language to their children in the Federal schools and as a result a bilingual series has also been begun for their use and several volumes were published during the year. As a result of the Inter-American Conference on Indian Life at Patzcuaro, Mexico, in April 1940, a number of the Southwest tribes requested that the reading and writing of Spanish be taught in Indian schools and the preparation of Spanish-English bilingual texts has been begun.

During the year 1941 the Indian Service has operated 226 day schools in the United States with an enrollment of 15,789 students, 115 day schools in Alaska with an enrollment of 6,444 students. During the same period of time it has operated 49 boarding schools

enrolling 14,429 students on a boarding basis and 1,974 on a day basis in the United States, and two boarding schools in Alaska enrolling 375 students on a boarding basis and 81 on a day basis.

Community Education and Defense

The rapid developments of the present emergency are making many demands upon Indians and thrusting many problems of adjustment upon them. Many who are entering training camps or industries are leaving the reservation for the first time. A good proportion of them speak English only hesitantly. Their understanding of the issues involved is meager. To meet this situation the Service is undertaking to expand its educational program both in its schools and among the adults in the communities. Instruction is given in the speaking and writing of English. Broad civic training is being provided that will enable the Indians to understand something of the issues in the present crisis and to appreciate intelligently the institutions of democracy. Vocational retraining for these Indians who have once had industrial skills but have allowed them to lapse through disuse is being intensified.

The successful participation of Indians in civic affairs, in the management of their tribal and economic affairs, in the national defense program, and in programs of rehabilitation, depends very largely upon their ability to use the English language fluently, to understand the nature of the institutions for which they, as citizens, and as members of a tribe are responsible, and to understand civic questions on which they must vote or otherwise express opinions. It depends further upon the possession of necessary skills for proper land use, or for employment in trade or industry, and upon a general knowledge of proper health habits, sanitation, nutrition, methods of child care, and general home making and community improvement.

At the present time many adult Indians have never been to school. Many of those who did attend for a few years of elementary training have returned to communities where little English is spoken and their ability to use the language soon lapses. Others have been to school for longer periods and perhaps have acquired considerable vocational skill only to find themselves without opportunity for employment during the past several years so that these skills have lapsed. These potential workers need retraining before being ready for jobs in defense or other industries where employment opportunities are now opening up.

The education of Indians for intelligent participation in defense activities goes hand in hand with their education for successful conduct of economic enterprises such as farming, dairying, arts and crafts, livestock, poultry, or other enterprises which are constantly being

opened up through additional land purchases, irrigation development, and the use of tribal and Federal funds for credit and for capital investments.

Many sources of civic education open to white citizens through radios, newspapers, clubs and organizational activities are closed to Indian groups because of the low economic level at which they live, or because of isolation. Social disintegration and the lack of organized community opinion strong enough to bring pressure for improved standards of living, have also made it difficult for Indians to adapt for their own needs many of the habits of health, sanitation, nutrition, and home and child care within their power economically.

The broadening of the adult education in Indian communities will supplement the work of the Extension Division which has been devoted to education in the fields of land use and homemaking, the work of the schools which have been concerned not only with classroom instruction but with the whole program of community education for better living, and the educational program of the Indian CCC. This last has afforded training to many young Indians in the use of various types of machinery and equipment, but it does not reach a majority of the population.

On reservations where there are Indian Service schools, selected ones are serving as centers for adult education and school personnel are being used also for adult instruction. On some of the larger reservations, it is proposed to employ one or two full time people for adult education work.

CCC Training

The CCC-ID program of work and training to conserve the Nation's land and human resources, under the supervision of the Office of Indian Affairs, has required no important change in the setting up of work projects to bring it definitely into the national defense picture. The conservation of forest, soil, and range, and the development of the reservation land areas, with the parallel objective of training for the best possible use of these resources, is definitely in the interest of national defense, as well as in the interest of the Indian people. This work has provided training for young men in occupational skills and related instruction, enabling them to participate in reservation activities, such as farming, cattle, sheep, etc., and in other Indian Service activities, or to render service in the military branch, and defense-connected industries. Many Indian enrollees, upon entering military service, have been assigned to jobs for which training and experience were gained under the CCC-ID program.

Coordination of CCC-ID training into the general Indian Service activities at the various agencies, and the use of the enrollee program in the afternoons as a community activity, are serving to build morale

and provide information and activities in the interest of good citizenship, essential for national defense.

An additional opportunity for CCC-ID enrollees in the interest of national defense, is being afforded through cooperation with the State departments of vocational education, under the provisions of Public Law 812. Approval has been granted for more than 200 CCC-ID enrollees to participate in such special courses as welding, metal work, telephone and radio maintenance and operation, and auto mechanics, permitting when necessary the use of 4 hours of work time per week, to supplement the necessary hours of leisure-time contributed by the enrollees, to courses which in some instances take full time from the work projects. The jurisdictions so far participating in the above include Phoenix School, Great Lakes Agency, Chemawa School, Umatilla Agency, Cheyenne River Agency, Sisseton Agency, Standing Rock Agency, Blackfeet Agency, Five Tribes Agency, and Pine Ridge Agency. Preparations for further participation are under way in many States.

Authority has also been received to train 50 to 60 Indian enrollees as hospital orderlies, and this project is going forward with the cooperation of the Indian Service Health Division.

Insofar as practicable all enrollees are being instructed in the American Red Cross standard course of first aid.

Leisure time is devoted to defense-connected training at practically all reservations.

Indians Practice Democracy

Perhaps the most significant contribution of the Government's work with Indians in connection with the present national and world situation is the revival of the smoldering sparks of democracy and self-government. Since 1935, the Indian tribes of the United States have been exploring anew the methods of democracy. In a world in which respect for personality, self-government and local democracy has been yielding to increasingly effective attack, these efforts of Indian tribes are particularly significant.

In spite of the fact that the courts repeatedly held that Indian tribes, once sovereign nations, are still domestic dependent states capable of exercising any powers of self-rule not specifically taken from them by treaty or by act of Congress, the Government's policies toward them were for two generations essentially dictatorial and in practice sought to destroy the local democracy guaranteed them by the courts.

Government officials in negotiating treaties with the Indians, sought always to deal with responsible tribal leaders. Tribal organization and tribal leadership were always recognized when treaties had to be made. No sooner, however, were these treaties signed, than the

Government set about to destroy tribal government and tribal leadership. Traditional chiefs and headsmen were often given allotments of land in areas removed from the groups which they had led, and in areas in which they would be in competition with other leaders, so that antagonisms, suspicions, and distrust were fostered on every hand. In all of its plans and programs the Indian Bureau dealt directly with individual Indians, rarely recognizing communities or tribal leadership. As this leadership was destroyed, it became more and more necessary for the Government to deal with Indians as individuals, which, of course, served still further to destroy leadership and thus set up a vicious circle of bureaucratic paternalism and resulted in disorganization among the Indians.

This knifing of Indian leadership and emasculation of tribal organization, further aided by the separation of the Indian from his land and the destruction of his land estate through forced allotments, did work havoc with Indian culture, Indian energy, Indian group capacity, and Indian citizenship, but they were not effective in totally destroying the local democracy of the Indians, or even in fundamentally modifying the Indian institutions. For the past several years, beginning with the passage in 1934 of the Indian Reorganization Act, a concerted effort has been made to reinstate Indian leadership, and to revive Indian democratic institutions. This problem has been attacked directly on the one hand by encouraging Indian tribes to organize, to adopt constitutions, to charter themselves and to set up various forms of self-government. The problem has been attacked indirectly by an effort to increase the land base of the Indians and by extending to them credit facilities and technical assistance to aid them in achieving economic independence.

This rebuilding of social organization, indigenous leadership, and self-government is significant not only in this country but throughout the countries of the hemisphere—for this program in the United States vividly dramatizes a changed attitude on the part of this country toward a minority of a different culture and blood and constitutes a significant reassurance to the neighboring countries to the south.

It has provided one of the needed foundations for hemisphere cooperation in defense of democracy.

The development of self-government among Indian tribes has followed no set pattern. The Reorganization Act provides that each tribe, if it chooses, may establish the machinery to exercise all of its inherent powers: the right to adopt a constitution, to operate its machinery of government, to determine membership or citizenship in the tribe, to levy taxes, to administer law and order, to regulate domestic relations, to veto the disposition of tribal assets, and increasingly to assume a political and economic control over its internal affairs similar to that of an incorporated municipality.

Some of the most effective forms of government which tribes have established grow out of their own native social organizations, in existence before the first European appeared, which never succumbed to the blandishments or the threats of the Federal guardian. Many of the forms of government developed by the tribes, fit at once their present needs as well as their living traditions. In many instances, they have combined the Anglo-Saxon type of representative government with institutional forms which derive directly from their own background. In one tribe which has made phenomenal progress within recent years toward economic rehabilitation as well as social and political rehabilitation, the tribe is governed by a council composed of representatives of historic villages. The representatives are directly and immediately accountable to the local electorate. The village district in this respect remains a source of power. It governs itself in local matters in accordance with its old customs and such changes are made from time to time as appear desirable and expedient.

Indians Administer Public Services

The progress of Indians in self-management of their affairs shows itself in the many aspects of the Department's program. Especially significant has been the increased participation by the Indians in the administration of public services and civic affairs. This has been especially true in the maintenance of law and order.

Before reservations were created, Indian nations handled all of their law and order problems. As sovereign nations they were subject to no control except that of their own making. Subsequent to treaties and the creation of reservations, the Congress made certain offenses committed by Indian against Indians within the boundaries of the reservation subject to the jurisdiction of the Federal courts. Till this day, other than these major offenses, ten in number, practically all matters of law and order are legally subject to administration only by the Indian tribe. Except in a few instances, crimes committed by Indians against Indians on Indian land are not subject to state laws or to the state courts.

The destruction of Indian social organization and the breakdown of Indian leadership made it extremely difficult for Indian tribes to administer law and order. For many years, the Department maintained a rough and ready sort of justice, through the instrumentality of courts of Indian offenses which were in effect parts of the administrative machinery of the Department. Since the passage of the Indian Reorganization Act, however, tribes are once again assuming responsibility for the maintenance of law and order. Tribal courts have been created, law and order codes adopted, native Indian police employed and the machinery established for the maintenance of law

and order. These tribal courts on the whole are functioning well. Without benefit of legal counsel, without judiciary trained in the white man's law, but with Indian judges schooled in Indian tradition and Indian social discipline and with native Indian police, these courts are very effectively maintaining law and order and administering justice within the reservations.

Indian administration of law and order has been especially successful on closed reservations (those in which lands have not been allotted but remain in tribal status). In allotted areas where Indian and whites are interspersed the problem is much more acute. Indian courts in some of these areas have not functioned for years. Often the county enforcement officers have undertaken the task of maintaining law and order. In the State of Kansas, recent legislation has made the Indians of that state subject to the laws of the State and to its courts in the same way that white people are. There are other areas where it probably would be advisable to have the Indians subject also to the laws of the state and to its courts.

There are, of course, many difficulties encountered in the maintenance of law and order in areas where the ancient social controls have disappeared and where newer disciplines have not replaced them. Drunkenness and the control of the liquor traffic still constitute a major problem in many Indian communities. Often factional interest and personal quarrels intrude to influence and affect the decisions of the courts. Often the absence of well-defined methods of appeal have resulted in injustice to defendants. Also the lack of adequate appropriations for the support of the courts and for the maintenance of an adequate police force have handicapped the administration of justice. That phenomenal progress has been made is obvious to any student of the situation. That much remains to be done by the Indians and the Indian Service before the social problems growing largely out of the impingement of the white culture can be solved is painfully evident.

Self-Government and Economic Improvement

Outstanding in the achievements of the Indians in the management of their own affairs has been the progress in the economic field. The Indian Reorganization Act contemplated that the tribal government should not alone be the government body politically but that it should play a large part in improving the economic condition of the people. Thus, the act provided that any tribe, having adopted a constitution, might charter itself as a business institution. Under a charter of incorporation, the tribal council or some committee appointed by it, is given broad powers in the direction of economic activities among the people of the reservation. These powers include the operation by the corporation of almost any form of business usually involving

the use of tribal assets, such as a tribal cattle enterprise, a lumber mill, a fishery, a cooperative store, a mining enterprise, or any form of economic activity in which the tribe wishes to engage. The chartered tribe under the act was made the lending agency to borrow and reloan from the revolving credit fund set up by the act. A corporation borrows from the fund at a very small rate of interest and reloans to members of the tribe or to cooperative groups at a slightly higher rate of interest. In many instances, tribes have voted to use their own tribal funds for land purchase or for loans to individual members or for the operation of tribal enterprises.

Tribal Enterprises

One of the most significant developments which has taken place among the Indians in recent years has been the growth in the number of tribally operated economic enterprises. The San Carlos Apache operate a tribal breeding herd, supplying registered animals to individuals and livestock associations on the reservation. They have adopted the most modern technologies including artificial insemination. In addition the tribe operates a herd of cattle, the income from which is used to support the aged and indigent members of the tribe. The Mescalero Apache have a similar herd known as the Social Security Herd. The Jicarilla Apache a few years ago took over the trading establishment on the reservation and for several years now have operated this very successfully as a tribal store. All of the wool and lambs from their flocks of sheep are sold through the store, and all of the necessary supplies which are imported to the reservation are bought through the store.

The Navajo operate a number of tribal enterprises: a sawmill, a cannery, a flour mill, and ram pastures. The sawmill was placed in operation July 23, 1940. Its present capacity is 8 million board feet and it employs on an average of 110 Navajo Indians each month and pays out to them \$5,700 in salaries. The tribal cannery has a capacity of 2,500 No. 2 cans daily, its entire output being consumed by the agency, either in its schools and hospitals or for relief. The Government purchases approximately 5,000 sheep and 265 head of cattle yearly from the Navajo Reservation for hospitals, schools, other Government institutions, and for relief rations. Eventually, the tribal cannery will be expanded to take care of all Government needs on the reservation. The ram pastures operate on a revolving fund. Rams are purchased and rented to individual Indians who make payments in lambs. The lambs are then marketed and the proceeds used for the purchase of more rams. The Navajo flour mill has a capacity of about 800,000 pounds annually. Over a period of years the Indians of the reservation consumed about

13,000,000 pounds of flour annually. This tribal operation could be extended many times over and still not have to go outside of the reservation for a market. If distribution can be worked out, the mill should lower the price of flour on the reservation.

The Arapahoe Padlock Ranch in Wyoming, the Lower Brule Livestock Association in South Dakota, and the Choctaw sheep raising and wool carding project in Oklahoma are other illustrations of tribal enterprises.

Not all of these tribal or corporate enterprises are as yet completely and independently managed by the Indians. A great deal of the direction is being given by employees of the Service and their success may in part be attributed to this fact. Indian Service administrative and technical personnel assume much of the responsibility and give a great deal of guidance but progressively they make themselves unnecessary.

A few years ago members of the Isleta Pueblo were urged to undertake a livestock enterprise. The tribe was unwilling to assume the responsibility but was willing that a Board of Trustees chosen from their people should be designated as the owners of the cattle and cooperate with the Government in the management of the herd. Today the entire herd is owned and managed, the sales and other phases of operation conducted entirely by the Indians themselves.

Five years ago many of the livestock on the San Carlos Reservation were the property of estates and most of the cattle were managed as a tribal herd. The responsibility for the management of the herd rested heavily upon the local reservation superintendent and his employees. Today the herd has been broken up, and except for the breeding herd and the "Old Folks" herd, the animals are in individual ownership, and the operations carried on by the Indians themselves through cooperative livestock associations.

A similar transition from Government management to Indian management is taking place among the Seminoles of Florida, as they are finding those livestock the means of achieving material improvement in their living standards.

Tribal Management of Credit

One of the handicaps which for years stifled Indian economic enterprise was the inability of the Indian to secure adequate credit to finance business endeavors. He could not pledge land in a trust or restricted status as security for commercial credit and no agency of the Government existed to meet this peculiar problem. Of course, in recent years the Farm Security Administration and other agencies of Government are actively engaged in meeting the credit needs of tenant farmers and

others who do not have sufficient collateral with which to obtain low interest loans from commercial credit agencies. The Indians, as have the white farmers, have profited considerably from these efforts of the Government, but most especially have they profited from the revolving loan fund authorized by the Indian Reorganization Act of 1934. This act relates the administration of the revolving loan fund to the machinery of self-government, also authorized by the act. It makes the Tribal Council or the tribal governing body the responsible individuals for administering credit to the Indians of that tribe. The administration of credit therefore becomes another one of the economic enterprises to be conducted by the chartered tribe and serves to enhance the power and prestige and effectiveness of the tribal government.

When a tribe has approved its charter and is eligible to secure a loan from the revolving loan fund, it usually appoints a committee from the governing council and places upon that committee the responsibility of canvassing the members of the tribe, ascertaining their needs, helping them to formulate satisfactory economic plans for the use of the loans, and in the end makes its recommendation for the approval or rejection of the loan application by the individual or cooperative group. These applications for loans are reviewed by a technical credit agent and every advice and assistance given to the individual Indian or group of Indians to be sure that the plans for the use of the money are economically sound. Fundamentally the success of the loan program depends upon the ability of the individual to derive from his enterprise a sufficient profit from which he can repay the money that has been advanced to him. Sound planning is, therefore, essential if the credit fund is to continue to revolve. Furthermore, as a requisite part of the program it serves as a highly practical educational medium.

On December 31, 1940, sixty-seven (67) Indian chartered corporations had loan funds at their disposal aggregating \$4,777,861, half of which was actually put into the hands of Indian borrowers. In addition, 34 Indian credit associations authorized under the Oklahoma Welfare Act had borrowed \$677,000, and \$275,000 had been loaned directly to individual Indians.

This represents the work of the last 4 years but the bulk of it has come within the past 2 years as an increasing number of tribes have secured charters of incorporation.

To date the repayment record on loans has been impressive—as fine as that of any agricultural credit agency in the country. These loans, while well secured, depend for repayment upon the adequacy of productive plans. As Indian groups and communities learn increasingly how to plan and to manage their enterprises, they will be able to profit far more from the use of the revolving credit funds.

Indian Livestock Associations

Nowhere has the ability of the Indians to manage their own affairs shown itself more vividly than in the growth and development of cooperative livestock associations. Livestock constitutes one of the Indians' chief assets. The range lands in ownership, including the forested area suitable for grazing, aggregate approximately 40,000 acres and constitute 80 percent of the total Indian land resource. These lands form an important part of the total national range resource, and their full utilization may prove an important contribution in the feeding of the peoples of impoverished countries.

Approximately 40 percent of the Indian-owned beef cattle are managed by cooperative livestock associations. These associations are playing an important part in furthering the industry, including all phases of improved breeding and management practices, range control and feed production. In 1933, there was a bare handful of these cooperatives, and apparently, it was believed that Indians did not have sufficient ability cooperatively to assume responsibility for the management of an enterprise like a cattle herd. In 1935, the handful of associations had grown to 53 in number. This number more than doubled the following year and has continued to increase until at the end of the calendar year 1940, there were 123 Indian livestock associations with a total membership of 7,565, owning 111,465 cattle, 25,689 sheep and 8,461 other classes of livestock.

These livestock associations have materially increased the income derived from the sale of cattle through improved breeding and management practices, feed production, and cooperative sales.

One of the major problems with which the Service has had to deal and which Indian organized tribes are increasingly facing is the problem of distributing the range resources equitably to all the members of the tribe. As in white society, so among the Indians, there is a tendency for a concentration of wealth. On many of the reservations, 10 percent of the Indians own from 75 to 85 percent of all the livestock, and control this same proportion of the range resources. So long as the ranges were not stocked to capacity this situation was not acute, but as a result of the large cattle pool created during the drought of 1934 and 1935, from which over 80,000 head of cattle have been issued to over 8,000 Indians on a repayment basis, and as a result of the extension of loans to those who wish to enter the cattle business, the ranges have increasingly become stocked up to and beyond their normal carrying capacity, and the problem of the large owner has become more acute. Where it has been necessary to carry on a program of stock reduction, as has been the case on a number of reservations, notably the Navajo, such reduction has been aimed first at the large owner. Unfortunately, it has not been possible to

permit the smaller owners to build up their holdings at the same time. Through the use of range fees and the development of range control through livestock associations and through the tribal councils, this problem is being partially solved and its recurrence being prevented.

Many of the Indian ranges formerly leased to white operators are now being utilized by Indians. San Carlos Reservation, for instance, just a few years ago was almost entirely leased to white operators. The fiscal year just passed saw the expiration of the last lease on this reservation, so that today these ranges are fully stocked with Indian-owned cattle.

The total acreage on Indian reservations used by Indians themselves for livestock operations has increased nearly 15 percent during the past 4 years. During the same period there has been a 22 percent decrease in the acreage leased to non-Indian operators.

In the Dakotas, especially, the leasing problem continues to handicap and slow down the efforts of the Service to bring about complete Indian use of the ranges. The great bulk of the land of the several Sioux reservations are still being leased to non-Indian operators. These lands were all allotted and are now, through the deaths of original allottees, in heirship status and badly fractionated, making their consolidation into range units under Indian control especially difficult. Moreover the high price of livestock at the present time makes doubly difficult the task of rehabilitating Indians on lands chiefly valuable for grazing.

Land Defense and the National Crisis

The defense effort is for the people of this Nation and for the preservation of their free institutions. It is also for the maintenance of the physical area within which the Americans and their freedoms may survive.

The land itself is the base upon which the democratic way of life may be pursued. It is the heritage of the whole people.

Our vast expanse of territory, with its rich farm soils, grasslands, forests, and waterways, was bequeathed to us by the Indian intact, in ecological balance. This priceless birthright was not treated kindly—or even intelligently. The soils were mined of their chemical elements, the grasslands were overloaded with livestock, the forests mowed down with extravagant and shortsighted violence. Dust storms, forest fires, and floods ensued—a national disgrace. The conservation movement was born of the profoundest patriotism. And in this movement, the Indian who saw the white man almost wreck the continent which has been his, has been a leader.

Though numerically small, the Indians possess collectively a substantial land estate—important to the Nation and important to the

defense effort: Four and three-quarter million acres of farm land, 30 million acres of grazing lands, 16 million acres of timber and woodland. Like the remainder of the country, the Indians' land was subjected to the same abuses which characterized this Nation during the period when it thought it could afford to be spendthrift. Further, like the remainder of the country, Indians lands are important not merely to their owners but also to the economy of the country.

The Indian Service should be excused if it calls attention to the fact that the Soil Erosion Service, created by Secretary Ickes in 1933, came into existence largely as a result of the Service's concern over the erosion problem on the Navajo Reservation. When that Service was transferred in 1935 to the Department of Agriculture, its name was changed to the Soil Conservation Service. Toward the end of the fiscal year 1940, President Roosevelt, as an important step in carrying out his comprehensive plan of reorganizing the Federal Government, transferred a portion of the funds and personnel of the Soil Conservation Service back to the Department of the Interior—i. e., he transferred the functions of that Service "with respect to the soil and moisture conservation operations conducted on lands under the jurisdiction of the Department of the Interior".

The President's action brought to the Indian Service great assistance in its program of improved utilization of the lands under its jurisdiction. How significant this action was will become increasingly apparent in years to come. Its effects are already being felt.

Prior to the President's Fourth Reorganization Plan, the Indian Service had developed very extensive cooperation with the Soil Conservation Service on a number of reservations; principally Papago, Gila River, Navajo, Pueblo, Pine Ridge, Nez Perce, Coeur D'Alene, and Wind River. A large part of the transferred funds and personnel represented allocations to continue work on these and some other areas.

The transferred activity was placed in the Resources Branch of the Indian Service alongside Civilian Conservation Corps-Indian Division, Forestry and Grazing, Land, and Extension Divisions. Close administrative identification with these other land-use divisions makes possible a more efficient and better coordinated program in the whole field of land utilization. It also permits a closer relationship between the resource programs on the reservations and the programs devoted to human betterment and rehabilitation. The conservation program in the Indian Service is twofold: Conservation of the people and conservation of their resources, the two being inseparably bound up one with the other.

The activities carried on during the year by the new unit of the Service included grass reseeding, range contour furrowing, building of check dams, dykes, and water spreading devices, the planting of trees, and surveys of ranges, forests, wildlife, and human dependency.

Increased attention is being directed toward small structural developments, planting, and seeding in connection with proper land use practices designed to give vegetation an opportunity to check water and soil losses.

A few reservations, having been so treated for a period of 5 to 8 years, showed a remarkable response this summer. Through the past few years the vegetation by proper use had been able gradually to recover from the ill effects of previous overuse and regain a degree of vegetative vigor. Precipitation the past winter and spring was the heaviest in years. Pastures properly used were able to utilize this additional moisture because the grass plant root systems were deeper, more extensive, more vigorous, and the whole plant more able to make use of the additional moisture in heavier growth. On June 1, galleta grass growth on pastures which have been overused for several years in the immediate past was only 2 inches compared to 6 inches in adjacent pastures where proper land use had been practiced during the past few years. Other important forage species showed the same proportionate differences.

Forestry

Indian forests have contributed materially to the national defense program during the past year. The records show that approximately 600,000,000 feet of timber with a value of \$1,835,000 was cut from Indian reservations during the fiscal year 1941. This is the largest cut since 1929. Much of the lumber manufactured from Indian timber has gone into the building of army cantonments and other defense housing projects. Large quantities of lumber have also gone into industrial defense enterprises. Indian timber has also gone into the manufacture of wood pulp for paper and into veneers for airplane construction and other purposes. Some of the spruce of the Northwest has been used in the construction of airplanes.

The increase in the utilization of Indian timber has been made within the sustained yield capacity of Indian forests and progress was made during the year in the development of sustained yield management plans, both for individual reservations and in cooperation with other agencies, including Federal, State and private. During the year the United States Circuit Court of Appeals for the Ninth Circuit Court upheld the authority of the Secretary of the Interior to control the cutting of timber on Indian allotments. This decision, if upheld by the United States Supreme Court, will insure the continued practice of forestry on Indian allotments.

There were several destructive forest fires on Indian reservations during the past year. These fires were especially severe in the Northwest during periods of dry weather. Forest fire protection over a period of many years has permitted an increase in inflammable

material so that when a fire does occur now it is apt to cause heavy damage if it is not controlled immediately.

Grazing

Large numbers of livestock grazed on Indian reservations contribute substantially to the food supply of the Nation. An adequate supply of meat is essential to the defense program. The records show that a total of 99,466 horses, 357,500 cattle, 1,417,007 sheep and goats were grazed on Indian reservations during the year. Cash receipts amounted to \$781,182.88 and free grazing by Indians added an additional value of \$623,111.30. Abundant snow and rainfall in many regions during the winter and spring have provided an abundant supply of forage for the grazing of livestock. This increase in feed in the Southwest has eased the problem of overgrazing and its resultant erosion of range lands.

On the Navajo Reservation, where for several years the Department has been pushing a program of stock reduction to bring the number grazed down to the maximum the range could support, the grazing regulations have been temporarily modified to delay drastic reductions. This tempers the sacrifice the Indians must make and gives a little more time in which to develop agricultural lands for the rehabilitation of those who can no longer be supported by the inadequate ranges. Studies were initiated during the year to conserve and manage the grazing lands used by the reindeer in Alaska.

Fish and Wildlife

During the year the Fish and Wildlife Service and the Office of Indian Affairs entered into a cooperative agreement with respect to the handling of fish and wildlife matters on Indian reservations. The Fish and Wildlife Service has received funds to carry on research studies for the improvement of fish and wildlife conditions on Indian reservations. It is planned to conduct an educational program to show the Indians the advantages of securing better hunting and fishing through the adherence to regulations designed to conserve these important resources. Studies have been conducted to determine the "usual and accustomed fishing places" of the Indians which were granted to them by various treaties. Decisions of the courts have been both favorable and unfavorable to the Indians in this matter and it is anticipated that the question will be finally determined by the United States Supreme Court during the present year. Fish and wildlife on Indian reservations provide substantial surplus quantities of food for the Nation. This is particularly true of the Red Lake Indian Fisheries in Minnesota and the salmon industry of the Northwest and Alaska.

Irrigation

Agriculture among the Indians depends largely upon the availability of irrigation. Southern Arizona has experienced a dry cycle for the past 20 years. Reservoirs have been almost empty and the Indian farmer along with the white farmer has endured a long period of drought and low crop production. This past spring, however, they have been able to plant all of their lands with the knowledge that there will be water available. Many of the reservoirs are already full and water is going over spillways that have never before been dampened.

The past year witnessed the completion of a dam across the Colorado River near Parker, Ariz., that is expected eventually to bring 100,000 acres of Indian desert land under cultivation. As much as necessary of these will be reserved for the present residents of the Colorado River reservation and the remainder will be utilized for the rehabilitation of Indians from reservations where the resources are hopelessly inadequate to support the resident population.

The Congress in its last session approved an appropriation of \$230,000 with which to construct a storage dam on the Navajo Reservation which will irrigate 8,000 acres of farm land so sorely needed by the 50,000 Navajo who are crowded in an arid area incapable, without the aid of irrigation structures, of supporting less than half that number.

In addition to these larger projects a large number of small ones are being developed on many reservations, especially in California and the Great Plains area.

These developments will aid the Indians materially in making more efficient use of their total resources, enable them increasingly to become independent, provide them with necessary food elements often lacking now and will add materially to the sum total of food products needed in the defense efforts.

The Water Conservation and Utilization Act, popularly known as the Case-Wheeler Act, was amended during the last session of Congress to provide (1) that the repayment of costs against Indian lands should be in accordance with existing law, and (2) that not to exceed 10 percent of the total appropriated might be expended on Indian lands. The effect of these amendments is to give specific notice of the availability of these funds for the development of Indian irrigation projects, and to postpone collection of construction charges so long as the land remains in Indian ownership.

Exploration of possible irrigation developments are being continuously carried on to comply with the President's suggestion that we have a "shelf of projects" with investigations completed, plans and specifications ready, so that men may be put to work when the peak of the defense program has passed.

Conserving the Health of Indians

A preliminary analysis of Indians examined and rejected under the Selective Service Act shows that approximately 30 percent are being rejected for physical unfitness. While the rate of rejection is slightly higher than for the general population, there is little doubt that Indians are in much better physical condition than during the previous war. In this connection it is interesting to note that of the 62 Haskell students who voluntarily enlisted in the Army or were inducted into service with National Guard units, not a single one was rejected for physical disability.

The death rate of Indians in the United States has steadily decreased during the past two decades, although it is still 25 percent higher than for the population as a whole.

The birth rate on the other hand continues high—35 percent higher than for the general population. Thus in terms of excesses of births over deaths the Indians are well over the rate for the country as a whole. A study of the vital statistics of recent years gives an increase in Indians of 1 percent per year as compared with 0.7 percent per year increase for the population as a whole.

These statistics give little suggestion of the years of intensive, sacrificial, intelligent work of physicians and nurses in the Indian Service who have worked under every imaginable handicap.

The introduction of public-health procedures in combating diseases—diseases that are community diseases, with causes that are community causes, and measures of cure that are community measures—was fraught with more obstacles in the Indian Service than in average rural areas. Yet the response by the Indians in most instances has been so over whelming as to tax beyond capacity the available facilities.

During 1940, 80 percent of Indian babies were born in Indian Service hospitals, whereas comparable economic groups probably had not more than 10 percent hospital births and the total United States population showed only 50 percent. More than 1 out of every 5 Indians availed themselves of hospital care during the year, as compared to 1 of every 15 of the general population. More than one-half million out-patient treatments were given during the year. Two new hospitals were opened in Alaska and efforts are being continued to increase health services to the natives there.

At a time when health and physical fitness are demanded by the Nation, more than ever before it is unfortunate that personnel and resources for medical care are inadequate. A large number of physicians and nurses have been released to the armed forces, often leaving hospitals and clinics greatly understaffed. New appointees are being assigned to posts before they can acquire desired experience. The turn-over in medical personnel during the past year has been unusually

high, and in some instances some phases of health work have had to be seriously curtailed.

This situation is being met in two ways: (1) securing more service from teachers, social workers, extension workers, and other employees in providing health education, improved health habits and nutrition, and (2) by the increased use of Indians in health work.

The number of graduate nurses among Indian girls is increasing yearly and their services are welcomed in and out of the Indian Service. The nurse's aid course for Indian girls at the Kiowa Hospital is being increased in size and a majority of the graduates are welcome additions to the hospital staffs. Those not accepting hospital positions are usually marrying and returning to Indian communities to voluntarily serve as health "missionaries" among their own people. A training course for hospital orderlies is being prepared in cooperation with CCC-ID, which division has also given splendid Red Cross first-aid courses to a large number of enrollees. Numerous stations are training selected employees in health-record work, laboratory and X-ray procedures, and various phases of health work. Results from health education have taxed available facilities, nevertheless every possible effort will continue to be made to carry on health education.

Tuberculosis continues to be the great health problem of the Indians. Previous studies, though not complete, have tended to show a higher incidence of the disease among Indians than among any other group of people. Recently the Office has attempted to conduct a number of complete surveys on selected reservations. In some instances as high as 98 percent of the entire reservation population has been examined, including chest X-rays.

While it is too early to make a positive statement concerning the incidence of tuberculosis among Indians as shown by these surveys, the preliminary evidence indicates that the occurrence of tuberculosis among Indians, while higher than the general population, hardly exceeds that of comparable economic groups. There is some evidence that Indians, are beginning to develop a resistance, not heretofore shown, to the disease.

Efforts are being made to arrange for hospitalization of tuberculous Indians in the various State sanatoria where Indian Service facilities are not available, and it is believed that this will prove more economical, as well as encouraging the Indians to accept hospitalization near their home reservations when they object to traveling great distances.

The vaccination of Indian children with *Bacillus-Calmette-Guerin* vaccine, or BCG, is being continued with very close follow-up study of the individuals and controls. In the 1,565 children receiving the vaccine, the incidence of tuberculosis appears to be definitely lower than in the unvaccinated control group. While definite conclusions cannot be drawn before the lapse of several years' observation, those

informed and interested in tuberculosis feel that the plan offers decided benefits in tuberculosis control. It will be necessary to continue the study for several years before conclusive evidence can be reported.

Eradication of Trachoma

Previous reports have told of the outstanding discoveries of Indian Service research workers in the cause and cure of the dread scourge of trachoma which has brought suffering and blindness to many Indians. Through the use of sulfanilamide therapy and an intensive campaign to eradicate this disease completely from among the Indians spectacular reduction in its incidence has been achieved.

A final report has been made on the 1,300 patients who were treated in a very closely controlled study and is probably the most encouraging report ever issued by the Health Division of the Indian Office. Approximately 70 percent of the cases treated showed complete arrest of the disease. A large percentage also had improved vision. Such inroads have been made that it is becoming difficult to find trachoma in some communities, particularly among school groups. An intensification of similar efforts directed toward infection among pre-school children and adults is under way and while results cannot be expected to equal those obtained among the more accessible school population, the entire Service feels highly encouraged over the situation.

Improvement of Vital Statistics

A source of dissatisfaction to the Health Division over a period of many years has been the inadequacy of accurate statistical data. Through the cooperation of medical statisticians of the Public Health Service an analysis of Indian Service reports and records is being undertaken. It is the expectation that it will result in a more complete knowledge of health conditions among the various tribes and thereby enable the Service to apply available funds and efforts toward a more satisfactory end.

Psychotherapeutic Effects of Indian Religions

For years Indian people were reluctant to accept modern medicine because it so often was in conflict with their own well developed systems of treatment. Indian Service officials on the other hand discouraged Indian curing ceremonials and sought constantly to discredit the Medicine Men.

In recent years, however, there has been a growing demand on the part of the Indians for hospitals and clinics at the same time an increased appreciation by the physicians of the role of the Medicine

Men. Not only are they discovering values in the Indians' medicinal herbs, massages, sweat baths, cathartics, and cauterizations, but they are sensing a strong psychotherapeutic value in the songs, prayers, and ceremonials of the Indians.

The Problem of Nutrition

An emphasis in the Indian Service upon the problem of nutrition parallels an increased public interest in this subject. The Indians in the continental United States and the natives of Alaska have undergone marked changes in dietary habits during the last two generations. The introduction of processed foods through schools, hospitals, and trading posts has meant too often the discarding of native foods, rich in essential vitamins. The use of white flour, refined sugar, canned goods, and other processed food to the exclusion of the native diet has resulted in poor nutrition, undernourishment, dental defects, and susceptibility to disease.

This problem becomes increasingly one of education as the Indian Service loses more direct means of control. When children were congregated in boarding schools, it was relatively simple to control the diets of children and to see that they secured necessary foods. Now that young children are living in their homes with their families and attending day schools where only a noon day lunch at most is served, it is not so easy to see that they secure proper food.

In the administration of relief, a similar loss of control is being experienced. Formerly relief was provided in the form of rations. Within limits, it was possible for the Service to determine of what the ration was to consist. Parenthetically, it should be added that not always were these rations selected scientifically. Today relief is almost entirely handled through the stamp plan and through agencies such as the Social Security Board, county and State welfare organizations. This method of administering relief leaves a large amount of discretion to the individual as to what he shall obtain. It represents a distinct step forward in the development of independence by the Indian, but, it also makes the task of improved dietary habits a much more difficult one and the Service must rely solely upon a program of education to bring this about.

Cooperation With Latin America

Latin-American relations were given a significant boost during the past year by the progress made in Inter-American Cooperation in Indian Affairs.

On May 21, 1941, there was announced the creation within the Office of Indian Affairs of a Division of Inter-American Cooperation.

This division was established to provide collaboration with administrators of public services to Indians, with Indian scholars in other American Republics, and with the Inter-American Indian Institute which was established provisionally in Mexico City in May 1940, pursuant to action taken at the First Inter-American Conference on Indian Life held at Pátzcuaro, Mexico, April 1940.

On November 29, 1940, Ambassador Daniels, in Mexico City, in behalf of the American Government, signed the Convention creating the Inter-American Indian Institute, designed to provide the machinery to effect an interchange of information and a clearing house of facts, and to facilitate the collaboration of American Republics in the administration of Indian Affairs.

This Convention was ratified by the United States Senate May 26, 1941.

In addition to creating an Inter-American Indian Institute, the Convention called also for the creation in each country of a national body to be affiliated with the institute, and to serve within each country as the agency for the collection and dissemination of information channeled through the central institute at Mexico City.

Pending action upon the Convention by the Congress and the appropriation of the necessary funds to carry out its provisions, the Indian Office sought aid from the Office of the Coordinator of Commercial and Cultural Relations Between the American Republics in the establishment of a Division of Inter-American Cooperation. Mr. Nelson Rockefeller, the coordinator, approved the plan and authorized a sufficient allocation of funds to finance the enterprise until June 30, 1942. This Division of Inter-American Cooperation is now functioning under the guidance of a policy committee consisting of Oscar L. Chapman, Assistant Secretary of the Interior, as chairman, Lawrence Duggan of the Department of State, and M. L. Wilson of the Department of Agriculture.

This new division of the Indian Office is now actively engaged in establishing contacts with officials of other countries concerned with the administration of Indian Affairs, and is planning to publish monographs in Spanish dealing with various aspects of Indian administration in the United States. The division will work with learned societies and scholars in the development and coordination of studies which will contribute to a better understanding of the problem of the Indians throughout the Western Hemisphere.

It is difficult to overestimate the significance for national defense of this newest development of the work of the department in relationship to Indians. In many American Republics the Indian population is predominant. Democracy within these countries will stand or fall largely in terms of the extent to which the social and economic problems of these masses, the Indians, are met and solved and to

the extent that their democratic heritage is permitted to function and spread. From an economic point of view alone the purchasing power latent in these groups, if adequately developed, would contribute materially to the stabilizing of the economy of the entire hemisphere. Cooperation between officials, who deal with this great and varied population and with scholars and interested laymen will play a vital role in reinforcing hemispheric solidarity, so essential to the preservation of democracy in this era of world disturbance. The collaboration of the various American governments upon the common problems of the Indians offers significant opportunities for the cementing of bonds of common interest between the United States and other American Republics.

Costa Rica, Cuba, Ecuador, El Salvador, Honduras, Mexico, Nicaragua, Panama, Peru, and the United States have to date indicated their intention of cooperating in this Inter-American project.

Indian Arts and Crafts

Indian arts and crafts are experiencing a wave of popularity due, undoubtedly, to the aggressive efforts of the Indian Arts and Crafts Board. Beginning with the exhibit at the San Francisco Fair 2 years ago, and climaxed with the exhibit at the Museum of Modern Art in New York City this past spring—two of the greatest exhibits of Indian art ever held—the Board has carried on an extensive program of public education in Indian arts and crafts.

The exhibit at the Museum of Modern Art, extending from January 21 to April 27, constituted the Board's main effort to create public appreciation of the beauty and usefulness of Indian art objects. In the organization of this exhibit, the Board had the cooperation of other Government agencies, of private individuals, and of universities and museums of science throughout this country and Canada. The exhibit was a cross section of the artistic achievement of the Indians of the United States during the last 15,000 years. It was divided into three sections—prehistoric, historic, and modern. It occupied three floors in the museum's galleries and contained the finest obtainable examples of all of the many techniques and design styles that have been perfected by the various tribal groups throughout this period.

Simultaneously with the opening of the exhibit, "Indian Arts of the United States," a book sponsored by the Board, was issued by the Museum of Modern Art. This book of 220 pages, with 16 color plates and 200 halftones, although complete in itself, followed the arrangement of and served as a guide to the exhibit.

Paralleling the efforts to stimulate public interest in the products of Indian craftsmanship, attention is now being focused upon the

opening up of wider markets and upon improved and increased production on the reservations.

To protect Indian producers of hand-made goods from the unfair competition of so-called Indian goods manufactured in large quantities by machine, thus forcing down the price of genuine Indian goods, the Board has originated and promoted the use of Government trademarks to distinguish genuine Indian goods from spurious imitations. Marks denoting genuineness and quality have been provided for Navajo, Pueblo, and Hopi silver jewelry, and certificates of genuineness have been issued covering Navajo all-wool woven fabrics and Alaskan Indian and Eskimo hand-made products.

A survey of the production costs of southwestern jewelry under various conditions, determined by the type of tools used in its manufacture, has just been completed. This survey was conducted by the Board with the assistance of local agencies, in an endeavor to find ways to protect the economic interest of the silver craftsmen. The standards for silver heretofore established by the Board specify not



HANDICRAFT PERPETUATES TRIBAL BEAUTY

Age-old Indian lore, woven into soft textiles or molded into colorful articles of jewelry and beadwork holds its present-day charm under an official stamp of authenticity affixed under the conservation program of the Office of Indian Affairs. This Rosebud Sioux maiden learns how to weave at the Mission Boarding School in South Dakota

only genuineness, but quality also, and apply to only a small part of the general output. As a result of the recent survey, it is hoped to evolve standards which will cover the whole field of southwestern silver.

The recent opening of the Museum of the Plains Indian, at Browning, Mont., housing the Plains Indian Cooperative Craft Shop; the installation of an Indian arts and crafts shop in the Rapid City Museum; and the development of craft shops at various agencies in the Plains area, all sponsored by the Board in cooperation with the Division of Education, have increased public interest in the arts of the Indians of this region. The sales of these shops, though not large, have consumed all of the quality production, and the demand is greater than the supply.

In Oklahoma, the weaving project carried on by the Division of Education at the Sequoyah Training School, which grew out of the Choctaw Spinning Association, originated by the Board 4 years ago, has for the past year concentrated on the making of yard goods. During a recent visit of the supervisor to Washington and New York, through the services of the Board, sufficient orders were received to consume the entire output for several months.

The organization of the Papago Indians in southern Arizona, formed 3 years ago, has, during the last year, steadily increased its production, gained new markets, and established a reputation for quality work. This organization is now supplying the Indians Arts Department of the Harvey System and several concessionaires in the national parks. The demand for Papago arts and crafts products, however, greatly exceeds present production.

In response to local requests, surveys have been conducted by the Board during the past year to determine the possibilities of establishing production centers among the Seminoles of Florida; the Mohawks and other tribes on the St. Regis Reservation, in the State of New York; and the Chippewa and other tribes of the Great Lakes agency, in Wisconsin and Michigan.

Seminole organization is already functioning at Brighton, Fla., under the name of the Seminole Crafts Guild of Glades County. At the other two jurisdictions, the projects have not yet reached a point of organization.

The improvement in quality in Indian-made articles, brought about by the work of the Indian Arts and Crafts Board, and the reception of these articles by the public, have definitely established that there are opportunities in this field for the building up of quality markets all over the United States. The ability of Indians to produce articles that are both decorative and useful cannot be questioned, nor can it be doubted that the public is willing to purchase such articles if they can be procured. The main obstacles yet to be overcome are the small

volume of production and the difficulties of distribution. The Board's activities during the last few months, therefore, have been centered largely in the organization of Indian enterprises, both for production and distribution. Most of the existing channels, such as the trading establishments along the highways in Indian country, are of little help in the development of this business. Their interests are limited largely to souvenirs, which usually do not produce sufficient return to the maker. The larger city markets offer a much greater range of possibilities. It has been the endeavor of the Board to create Indian producing and merchandising enterprises that will manufacture such products in sufficient quantities to reach their new markets directly with the help of the Board. In addition to the organizations previously established, establishment of Indian producing and marketing organizations for the Navajo and Pueblo Indians of the Southwest is now under way.

In consultation with the United States Patent Office, the Board is preparing a system of trade-marks to promote and protect the work of such Indian enterprises. These trade-marks, plus the stamps of genuineness and quality, should materially aid to eliminate unfair competition which has so handicapped Indian crafts.

Income from home industries and crafts for most will, undoubtedly, be only supplemental to that derived from livestock, agriculture, forestry, and the like. It is rapidly becoming, however, a significant contribution to their economic rehabilitation and the improvement of their standards of living.

Employment of Indians in the Indian Service

For a number of years the Indian Service has given preference to qualified Indians in filling positions in the Indian Service. As a result of these efforts, the number of Indians employed has gradually increased until on October 1, 1940, over 5,000 were holding permanent positions in the Service. This was approximately 60 percent of the total number of regular employees.

The entrance requirements of positions in the Indian Service are established by the Civil Service Commission in its competitive examinations announced from time to time. Until recently an Indian, to be appointed to a position in the Service, had to meet those requirements. It was not necessary that he compete with other applicants, but he was eligible for appointment if he could satisfy the basic or minimum standards established by the Commission.

Under the provisions of the Indian Reorganization Act the Secretary was authorized to establish standards of health, age, character, experience, knowledge, and ability for Indians who might be appointed without regard to civil service laws to the various positions maintained

by the Indian Office. Such qualified Indians were to have preference to appointment to vacancies in any position. Lack of personnel has prevented the Office from undertaking to accomplish this on a broad scale and to date standards have been established for relatively few positions in the Service. In lieu of these standards, the Office has utilized the standards established by the Civil Service Commission and Indians are required to comply with them.

Recently, however, the President, by Executive order, has removed Indians from schedule B of the civil-service regulations to schedule A, which, in effect, provides that the Civil Service Commission will exact no standard or requirements of Indians of one-fourth or more degree of Indian blood, and places upon the Indian Office the responsibility for determining the fitness of Indians for employment in the Service.

To meet this changed condition, the Congress has appropriated for the fiscal year 1942, the sum of \$20,000 to enable the Office to establish a merit system for Indians by which Indians will compete against Indians for positions in the Service. Steps are already under way to develop an inventory of Indians and their abilities and capacities, to analyze the various position in the Indian Service as to their duties and requirements, and to establish procedure whereby the best qualified Indians will be employed in any vacancy arising in the Service if it is possible to find one adequately qualified.

This will involve establishing standards and basic requirements for every type of position in the Service. It will necessitate an evaluation of assets which are peculiar to the Indians, such as ability to speak the native language, and demonstrated leadership within an Indian social group. It will require the development of the best means of selection, placement, and training.

Indian Office Reorganization

During the past year the Washington office has undergone considerable reorganization. For 10 years there has been no material modification in the organizational structure of the Washington or of the field offices of the Indian Service. During that time, appropriations from gratuity funds and from tribal funds for administrative purposes increased from approximately \$25,000,000 to \$35,000,000. In addition, the Office has had the responsibility for administering funds from the CCC, Farm Security Administration, and other emergency agencies.

Many entirely new functions have devolved upon the Indian Service during this period, notably those arising from the Indian Reorganization Act, which include a comprehensive land-purchase program, administration of a revolving credit fund, the organization of

tribes for self-government, and the marked increase of Indian participation in the administration of Indian affairs. Other new and additional functions are rehabilitation work with funds appropriated by the various relief acts, soil and moisture conservation, CCC-ID operations, administration of all matters affecting the natives of Alaska, and extensive WPA projects. To discharge these new functions, a number of new divisions have been created, but until now these activities have not been grouped into branches containing related functions.

The reorganization establishes five branches: Administration, Planning and Development, Community Services, Indian Resources, and Engineering. Under these branches are grouped all of the many divisions which have heretofore been separate and independent, each division director reporting directly to the Commissioner.

The Administrative Branch will handle the business management of the office, including the preparation of budget estimates and their justification before the Bureau of the Budget and Congress, the allotments of funds to the various jurisdictions, the management of personnel, and the direction of the mails and files and other aspects of office management.

The Planning and Development Branch will coordinate planning work and in cooperation with field and office authorities will project long-range programs.

The Indian Resources Branch will be charged with seeing that a wise and intelligent use is made of Indian resources. Indian forests, grazing lands, agricultural lands, tribal funds, oil, gas, and minerals are the resources which this branch must look after. Whether these resources are to be squandered, merely conserved intact, or wisely used as a means of rehabilitating the Indian and helping him to achieve economic independence and full citizenship rests largely upon this branch and the divisions which go to make it up.

The Community Services Branch as its name implies is concerned with providing Indian communities with the services necessary to their welfare, such as school and health facilities, enforcement of law and order, relief, and other social services.

The Engineering Branch groups the divisions of roads, construction, and irrigation.

Personnel Research

The end of the fiscal year 1941 brought to a close the 3-year program in recruiting and training administrative personnel carried on by the Southwest Field Training Program at Albuquerque, N. Mex. This program was financed by a grant from the Rockefeller Foundation and operated through a cooperative agreement with the Institute of Public Affairs. Each year during this 3-year period 12 to 15 college

graduates seeking careers in the public service were chosen from several hundred applicants from a score of universities. For 12 months each student was trained and tested through administrative assignments of increasing severity and complexity. Many of the graduates of this program are now in regular Federal employment in positions of considerable responsibility. Although carried on for a very limited time and the results far from conclusive, the experiment has amply demonstrated that the testing and training of administrators through responsible job assignments is feasible and productive.

With the expiration of the foundation grant it has become necessary to modify somewhat this program. The method now used selects from civil-service registers of "student aids" approximately 30 college juniors, gives this group an intensive summer training program, selects from the 30 those who show outstanding ability and continues them for a second summer. As soon as a student has satisfactorily completed 6 months of service, he will have completed his probational appointment and will be eligible for an assignment to any vacancy either in the Indian Service or some other agency of Government. The main cost of this training program is borne by the Indian Service, with some help from the Rockefeller Foundation for the current year. This training consists largely of administrative assignment progressively more difficult and complex.

Indian Service—A Decentralized Agency

In the light of the current efforts of Government agencies to decentralize, it is interesting to note the degree to which decentralization has been accomplished in the Indian Service. The Washington office staff constitutes less than 3 percent of the regular employees of the Service—sufficient merely to give direction to policies and to maintain necessary relations with the Congress and with other governmental agencies. Funds for operations within the District constitute about 2 percent of the total appropriations for the Indian Service—the smallest Washington limitation of any agency of the Government.

Land Relinquished for Defense

As a result of a study of the economic needs of the Navajo Indians made in 1934 by a representative of the Department of Agriculture at the request of the Commissioner of Indian Affairs, a sheep-breeding and range laboratory for the investigation of sheep genetics was constructed at Fort Wingate, N. Mex. This laboratory has been continuously operated by the Indian Service in cooperation with the Department of Agriculture. The primary objective of the research work conducted at the laboratory is to develop a type of sheep that will produce a larger quantity of quality wool than the Navajo type

on the reservation and that will produce a lamb demanding a good price on the commercial market.

The results of the 5 years of research work carried on by the laboratory have been very encouraging. Methods and techniques have been developed for measuring the factors involved in research with Navajo sheep. The type of sheep best adapted to the region and the peculiar needs of the Navajo people have been determined. The breeding program has been designed to maintain the old type Navajo sheep and ultimately to produce the desired type by using the Navajo type as a base or starting point. By using improved methods of livestock and range management, unit sheep production on the laboratory range area has been increased considerably over that obtained by the same type of sheep on the reservation.

With the development at Fort Wingate by the War Department of a large munitions storage depot, the War Department has found it necessary to ask the laboratory for the relinquishment of 5,300 acres, which includes the best range within the reserve. After this withdrawal is made, there will remain only 12,356 acres of range land and one permanent watering place at the bottom of an almost inaccessible canyon. Approximately half of the remaining land is not usable because of the rough wooded terrain, sparse vegetation and the lack of stock water.

Unless some arrangements can be made to secure lands to replace the relinquished area the research work of the laboratory will be seriously restricted during the coming year.

The Work of the Indian Service in Alaska

The Office of Indian Affairs, in addition to its work with the Indians of the continental United States, has responsibility for the social and economic welfare of the 32,000 natives of Alaska, including both Indians and Eskimos. In addition to maintaining a system of schools and hospitals, the Federal Government has been mainly concerned with the economic rehabilitation of these natives through their principal industries: fishing, trapping, and reindeer.

During the past 2 years, however, Alaska has become a center of military activities and the 625 teachers, doctors, nurses, community workers, administrators, and reindeer experts of the Indian Service are playing a significant role in the development of this vital bulwark of national defense.

The Army has set up an experimental board at Fort Richardson, Alaska, to study and experiment with types of equipment, food, and clothing, peculiar to their needs within the Territory. This board, working with the Arts and Crafts Division of the Alaska Indian Service has been experimenting with the following products made or

processed by the natives of Alaska: parkas, mukluks, sealskin trousers, mittens, fur socks, fur insoles, moosehide moccasins, snowshoes, dog sleds, and dried and smoked salmon.

For the past 3 years an organized crafts program has been carried on in the Territory of Alaska as part of the Indian Service educational program. Directed by a supervisor of native arts and crafts and a field demonstration teacher, who work with day and boarding school teachers, the program has enlisted and trained 9,552 men and women in the production of articles for their own use or for commercial sale, and is teaching craft work to 1,777 boys and girls in the schools. Eighty-five of the one hundred and eighteen Indian Affairs stations in the Territory are carrying on craft programs. In addition to the goods listed above which are produced for marketing in 1940, the native craftsmen produced for their own use articles valued at \$107,159.

Craft activities include basketry, blanket making, ivory and wood carving, tanning and the making of fur garments, snowshoes, sleds, and boats. The Arts and Crafts Division maintains a clearing house through which finished articles are sold to dealers in Alaska, Canada, the United States, and the Philippines. The clearing house also sells raw materials to the workers, thereby enabling them to realize a greater profit on their work.

In 1938 Alaskan arts and crafts produced an income to the natives of \$98,265. In 1939 this increased to \$130,623, and a year later leaped to \$180,907.

Another tangible and important contribution to national defense was the loan to the Coast Guard of the *North Star*, famed vessel which has flown the Stars and Stripes in the Arctic and Antarctic. The call to the colors diverted the vessel from its customary dramatic rounds of carrying supplies, medical aid, and personnel to remote and sometimes almost inaccessible stations in Alaska. Since 1932, with time out for trips to Antarctica, it has served the Office of Indian Affairs as a means of contact with the outside world for Indian Service employees and for other Federal representatives in northwestern Alaska. In 1939 jurisdiction over the vessel was transferred from the Interior Department, and it was loaned, with officers and crew, to the United States Antarctic Service. The first trip was made in late 1939, transporting the Government exploration party to the Antarctic. The *North Star* returned to Arctic duty the following year, and made two trips north for the Indian Service before leaving again for the Antarctic.

For Eskimos, Indians, and white alike in Alaska, located beyond private transportation lines, the arrival of the Indian Service ships marks their only touch with the outside world. Indian Service ships usually bring medical supplies, mail, clothing, reading matter, radios, hundreds of cases of canned foodstuffs and building materials.

At the northernmost tip of Alaska, during the period when the Arctic ice floes are blown offshore by a favorable wind, landing is hazardous. For only about 3 weeks in late August and early September is it possible for the ship to reach Point Barrow. Cargo must be discharged there with all possible speed and the southerly voyage begun without delay in order to avoid danger of being crushed in the Arctic floes. In some ports, the ships cannot land at all, but must arduously transfer their loads to lighters.

In sharp focus in a troubled world is the democratic existence of the natives of Little Diomed Island. Less than a mile from Big Diomed Island, owned by Russia, the farthestmost western American point of land is distinctly a stronghold of individuality and progress.

Held by anthropologists to have been one of the "stepping stones" by which man first crossed from Asia and discovered North America, Little Diomed is inhabited by a population of 144 Eskimos who are under the care of the Office of Indian Affairs.

The natives of Little Diomed, though extremely isolated and primitive, have organized themselves under the terms of the Alaska amendments to the Indian Reorganization Act. A report in connection with the organization of the Little Diomed natives provide some interesting background information. It is an interesting commentary that the ideal of democracy has been carried to the farthestmost outpost of the United States territory to a people far removed in language, background, and otherwise, from the dominant population of the country. Extracts from the report follow:

The people on Little Diomed Island are all full-blood Eskimos except three adopted children which are half-bloods. The date of the original establishment of the village is not known. A former location of the village which was on a sand spit is now under water. The school is located on an old cemetery site. Prior to the limitation set on boundaries between Russia and the United States, there was considerable intercourse between the natives of Little Diomed Island and the Siberian Mainland. The earliest record of Little Diomed Island is that of Popoff, who dwelt for a time among the natives of the Siberian coast of Bering Strait. In the early days the natives acted as middlemen and traders between the people of America and Asia. The profits of such traffic provided a living so they engaged but little in hunting and fishing.

Ivory carving produces the largest part of the annual cash income. The majority of the men carve during the winter when there is very little hunting to be done and the older men carve during the summer while the younger men work other jobs or hunt and fish.

This group was governed by a chief until his death in 1920. Since that time the people have elected a mayor who has been expected to enforce the rules of the village.

In a territory containing 586,400 square miles, equal to one-fifth the size of the entire United States, there is a very small proportion of land suitable for cultivation. The native population, equal in number to the whites, is scattered along the 25,000 miles of coast and

on the great rivers of Alaska, in villages varying from 30 to 600 persons. The poor agricultural soil, sparse population, extreme climate, and the lack of communication and transportation facilities are all important factors in devising a program for improving native standards of living and planning for ultimate native economic independence.

Fishing Most Important Alaskan Industry

The fishing industry is the largest and most important source of income, employment, and subsistence in Alaska for both whites and natives. The total value of products derived from this source amounts to approximately \$50,000,000 annually; more than 100 salmon canneries are operated, of which two are native-owned and operated; about 28,000 persons are employed, including about 7,000 Indians.

Originally the Indians possessed hereditary rights to specific fishing areas, based upon tribal customs from time immemorial. The white corporations came to Alaska and established fish traps and salmon canneries; laws were enacted establishing forest reserves and national monuments; and regulations were imposed which restricted the Indians' fishing rights and privileges. In an effort to restore such fishing privileges as may be necessary to guarantee to the Indian a decent living, the Indian Office has set aside reservations of water and land for the exclusive use of the Indians. The Indian Office also cooperates with other Government agencies in efforts to protect the interests of the Indians at all times.

Even in areas where there is little commercial fishing, the Indians and Eskimos are dependent upon fishing for a large part of their own subsistence and that of their dogs, which are an important part of their economy in northern Alaska. Throughout Alaska, salmon are caught in the summer in great quantities and dried for use throughout the winter.

Self-management of economic enterprises by the natives of Alaska is well illustrated by the Metlakahtla fishing industry.

Metlakahtla—A Self-Sustaining Fishing Community

The land known as Annette Islands was set apart as a reserve for the Metlakahtlans by act of Congress, March 3, 1891.

The natives of Metlakahtla moved from Metlakahtla in British Columbia, in 1887, and established a new colony on Annette Island, Alaska, which was given the same name of "Metlakahtla." Under the leadership of Father Duncan the Indians established a salmon cannery, sawmill, and store. These various enterprises provided employment for the natives and were sufficiently profitable to enable Father Duncan to carry on a school for the natives and to accumulate

considerable money. Several years prior to 1913 Father Duncan discontinued operation of the industries and the school, and the natives were without employment or educational facilities. As a result, the Secretary of the Interior, through the Bureau of Education, established a school at Metlakahtla in 1913 and under date of January 28, 1915, approved Rules and Regulations for Annette Islands Reserve, Alaska, for Metlakahtla Indians and other Alaskan Natives. These were the first rules issued by the Secretary of the Interior under authority of the act of March 3, 1891.

The Department, through the Office of Indian Affairs, leases the fishing privileges in the waters surrounding Annette Island to commercial operators under 5-year contracts. From the proceeds received from these leases, the Metlakahtlans have built a cooperative modern cannery, which furnishes them employment. Profits from the cannery are used for water, electric light, sewers, medical relief, the construction of a town hall, and various community projects.

Metlakahtla has a population of about 600 members of the Tsimshian Tribe. It is a self-sustaining community, which has never asked for or received relief from the Federal Government or from any outside source even at the depth of the depression. The profits to the community from the operation of the salmon cannery vary from season to season, but during recent years they have ranged from \$75,000 to as high as \$111,000 per annum.

In addition to these funds which are used for community purposes, the Indians receive approximately \$75,000 per annum as wages for working in the cannery and from the sale of fish to the cannery. The Metlakahtlans possess not only a reservation of land, but also 3,000 feet of water along the shores of Annette Island, which gives them the exclusive privilege of fishing in these waters. The tradition of thrift, careful management, and mutual cooperation launched by Father Duncan has continued to the present day.

The present cannery is owned by the Indians and is a modern, well-equipped plant. This source of income to the Metlakahtla Indians is supplemented by the community sawmill, also owned by the village in common, by boat building and by profits from native owned and operated stores. The Metlakahtlans also own and manage their hydroelectric power and light plant, which furnished power, light, and water to every home in the village without charge. Metlakahtla contains the largest church in Alaska and the largest building used as a town hall. Both of these buildings were constructed by the Indians themselves.

Trapping and Fur Farms

As fishing is the chief source of income to the Indians of southeastern Alaska, so is trapping and fur farming the chief source of

income to the Eskimos of the Arctic and Bering Sea coasts, the Aleuts of the Alaskan Peninsula and the Aleutian Islands, and the Athapascan Indians of the interior.

Alaskan trappers, numbering approximately 8,000 and including a substantial percentage of natives, export furs valued at \$2,000,000 each year. These furs are chiefly mink, beaver, fox, lynx, muskrat, and marten.

The Office of Indian Affairs endeavors to protect the Indians and Eskimos in the fur industry primarily by preventing white trappers, who exploit the trade and deprive the natives of their rights, from operating in areas which have belonged to the natives for many years. Wherever such action is necessary, every effort is made to set aside trapping and hunting reservations for the exclusive use of the Indians as has been done in the Tetlin region of the Upper Tanana River Valley.

On the Aleutian Islands, there are numerous blue fox ranches, where the animals are allowed to run wild on small, uninhabited islands. A number of these island ranches are operated by Aleut communities under permits granted by the Alaska Game Commission. The Federal Government assists natives in securing the exclusive use of such islands, as well as in the management of their fox ranches and in marketing the fox pelts in Seattle.

Reindeer Important to Native Subsistence

When the United States purchased Alaska from Russia in 1867, there were no domesticated reindeer on the North American Continent. For their food supply the Eskimos depended upon fish, game, and the mammals of the sea.

In 1884 the Department of the Interior, through the United States Bureau of Education, assumed jurisdiction over the natives of Alaska, introduced schools among them, and became actively interested in their economic welfare. The general agent for the Bureau of Education during his annual visits of Alaska found that the Eskimos of the Arctic and Bering Sea coasts experienced periodic years of famine when their supply of food became depleted and fish were unobtainable because of ice conditions, and many died of starvation. The natives on the other side of Bering Strait in Siberia, however, were safe from such a fate due to the possession of large herds of domesticated reindeer.

This fact was brought to the attention of Government officials and Members of Congress. As a result, the Congress made annual appropriations, beginning in 1893, for the purchase and importation of reindeer from Siberia and for their distribution to Eskimos in Alaska, in order to provide a dependable source of food and clothing

for the Eskimos which would be available locally at all times and would obviate famine conditions. Furthermore, it was intended that the ownership of reindeer should be restricted to the Eskimos, and the ownership of female reindeer by whites was forbidden by Government regulations.

Between 1892 and 1902, 1,280 reindeer were purchased in Siberia and transported to Alaska. This original herd has multiplied until now there are in excess of 500,000 reindeer in Alaska.

With the importation of reindeer, a number of Lapp herders were brought to Alaska to train the Eskimos in herding reindeer. Nearly all of the Lapps and their descendants remained in Alaska permanently.

The reindeer industry, established as a subsistence for the natives, grew to such an extent that white businessmen entered the field for the purpose of raising and selling reindeer commercially in competition with other meat products raised in the States.

In 1914 the Lomen Reindeer Corporation (Northwestern Livestock Corporation) purchased from a Lapp owner, Alfred Nilima, reindeer which he had obtained through his services with the Government as trainer of apprentice Eskimos. Other nonnatives, including Lapps, also obtained reindeer, until approximately 30 percent of the reindeer came into the hands of nonnatives, with the Northwestern Livestock Corporation the largest single holder.

Overgrazing Threatens Reindeer Range

The operations by nonnative owners seriously jeopardized the interests of the natives because of the difficulties in keeping ownership records and the struggle for the most desirable range. Overgrazing resulted and threatened the destruction of both the range and the herds.

Reindeer Returned to Native Ownership

To solve the problem the Interior Department presented to the Congress a plan to eliminate nonnative ownership of reindeer in Alaska, and thereby to end for all time the controversies between white and Eskimo owners of reindeer. The Congress recognized the need and passed the act of September 1, 1937, which provided for the purchase by the Government of all reindeer owned by nonnatives and the establishment of the reindeer industry in Alaska on an exclusively native-owned basis. Funds for this purpose were made available August 9, 1939.

The Secretary of the Interior appointed a special representative to ascertain the number of reindeer belonging to each nonnative owner and to negotiate with them for the purchase of their reindeer. These negotiations were completed during the past year and all white-owned reindeer were purchased and distributed to the Eskimos.

A grazing, herding, and management program has been developed which will make the reindeer industry in Alaska what it was originally intended to be: a dependable local subsistence and clothing enterprise carried on by the Eskimos themselves with a minimum of supervision by Government employees.

Problems Ahead

Vital to the whole program of Indian rehabilitation is the expansion of the land base. Since 1933, 4½ million acres have been added to the total Indian land holdings. Some land was purchased from appropriations made by the Congress, pursuant to the Reorganization Act, some was bought by Indian tribes with their own tribal funds, some submarginal lands were purchased with emergency funds. A sixth of the total represents a restoration to tribes of Indian lands which had been opened to entry; 30 percent was obtained by setting aside public domain lands for Indian use.

While these additions represent a significant gain, they are only a sixth of the urgent land needs of the Indian population as estimated by the National Resources Committee. Most of the Indian groups are still seriously in need of additional acreages of a desirable character. Moreover, there are large numbers of Indians scattered throughout the various States who are without land resources of any kind whatever. In the State of Montana, for instance, there are 600 families known to the Indian Service who are seriously in need of assistance. Many of them live in disreputable shacks on the edges of towns and along main highways. Their deplorable condition reflects upon the people of the State and upon the Federal Government. They are a problem to the State and local Government. They are subsisting under an extremely low economic level, are health hazards to the communities in which they live, constant solicitors of charity, and a source of friction between the white and Indian populations.

On the Turtle Mountain Reservation in North Dakota more than 1,000 Indian families have been endeavoring to eke out an existence on land barely adequate to keep 200 families from starving.

The situation of the landless Indians is probably the worst of the entire Indian picture. The first essential in any program of rehabilitation is the purchase of adequate lands for an economic base. It will require, however, more than a gift of land to bring them to a state of independence and social responsibility. The land will have to be supplemented by loans and grants to finance their productive use, and by continued guidance and assistance as well as by essential public services in the form of facilities for education, sanitation, health and the maintenance of law and order.

The Indian Reorganization Act of June 18, 1934, authorized an

annual appropriation of \$2,000,000 for land purchases. During the 5-year period from 1936 to 1940, less than \$4,000,000 of these authorized funds has been made available for land purchase. Without the full annual appropriation carried on for a 10-year period, it can hardly be expected that the economic independence and social rehabilitation contemplated by the act can be accomplished with any degree of rapidity.

To date the increased amount of employment, attributable to the defense program, has not perceptibly affected the Indians. They live, as a rule, in isolated rural areas where the benefits of the defense program have not yet percolated. Their principal economies are agriculture and livestock, both of which are wholly dependent upon the availability of suitable land. These landless groups are continuing to require large amounts of relief, not only from the Federal Government but from the States and counties as well.

Post-War Problems

One of the matters causing concern to the Office of Indian Affairs is the task of making provision now to take care of the several thousand Indians who will return to reservations at the end of the emergency. Already over three thousand are in the armed forces and another three or four thousand are engaged in defense industries. The Indians will be among the first to be affected by the shrinkage of employment opportunities subsequent to the war, and, if the past is any guide, they will return in large numbers to their home reservations. With resources inadequate to meet the needs of those already there, the problem of providing employment opportunities and a means of livelihood for each of the returned soldiers and workers will prove a staggering task.

Anticipating these needs, the Indian Service is developing a "shelf" of work projects, largely in the reclamation of arid land and the resettlement and rehabilitation of Indians thereon. The Colorado River project, for instance which contemplates the ultimate subjugation and resettlement of 100,000 acres, can take care of large numbers of workers, for a 3- to 5-year period, who will be engaged in land subjugation, canal and road construction, fencing, tree planting, and house building. As the land is brought under irrigation permanent homes and means of livelihood can be provided.

Other reclamation projects are being surveyed and plans developed. The possibilities of small industries are also being studied.

Indian Lands are Still Leased

Progress is slow and often discouraging in turning Indian lands from non-Indian use into Indian use. The allotment of reservations not

only resulted in the loss of two-thirds of the Indian land, but left the remainder in such a status that much of it cannot be used by the Indians. Original allottees have died, their allotments have descended to their heirs, and then to the second or third generation of heirs. Small tracts have been divided and subdivided, and the number of owners has multiplied. There grew up in the Service as the only way to use these lands the practice of leasing them to large scale white operators. The Service is attempting to consolidate these small tracts and undivided interests into larger and usable units and to devise ways of placing them in Indian use.

Several problems present themselves in this effort. In the first place, the owners are often widely scattered and the purely mechanical task of locating them in order to secure agreements from them is time consuming. In the second place, the owners are reluctant to exchange their tangible interest in land for use privileges or dividends from Indian enterprises. They have become accustomed to the unearned income from the leasing operations and much prefer to continue even though it means a reduced standard of living and much idleness.

The situation is particularly bad in the Dakotas and Montana, where several thousand petty landlords subsist on the small lease returns, supplemented by various forms of work relief. Efforts are being concentrated now on four of the Sioux reservations to consolidate lands around developing economic enterprises from which it is possible to offer the owners something tangible in the way of economic returns in exchange for the use of their lands.

It is possible that the situation will have to become worse before it can be improved—that is, that lands will have to be further subdivided until holdings have no economic value before they can be consolidated or returned to tribal status.

Civilian Conservation Corps

CONRAD L. WIRTH. Representative, Department of the
Interior Advisory Council, Civilian Conservation Corps

DURING the fiscal year 1941 six bureaus and offices of the Department of the Interior, whose responsibilities are concerned with the conservation and proper development of the Nation's natural resources, supervised the operation of an average of 479 Civilian Conservation Corps camps and 71 CCC-Indian units in 47 States and the District of Columbia, and 1,400 enrollees in 10 groups in Hawaii, Alaska, and the Virgin Islands.

Work projects covered the development of recreational facilities in national, State, and local parks; protection and improvement of Federal grazing lands and Indian reservations; protection and propagation of wildlife; cooperation in the development of irrigation and hydroelectric power programs; broad conservation of the public domain; and rehabilitation of the human and natural resources of the islands and territorial possessions.

Emphasis on the vocational training of the enrollees, with special attention to those trades which fit into the defense picture was the year's most prominent development. Courses are given in the camps in the evenings and put to the test on the jobs next day. Many enrollees are finding outlets for this training in the defense industries. Hand in hand with these courses is a safety program which produced an 18 percent reduction in lost-time accidents and a 34 percent improvement in severity of accidents as compared to the figures for 1940.

General Land Office Camps

During the year the General Land Office operated six CCC camps in continental United States and a fire-control project in Alaska. There were five continental camps in Oregon and one in Wyoming.

The five camps assigned to the General Land Office for conservation on the 2,500,000 acres of the Oregon and California revested lands in Oregon were engaged in work planned to protect and conserve this

great reservoir of commercial timber and further to facilitate its sustained yield management. The objective of perpetual forest productivity is being attained by developing improvements which will provide increased protection and more efficient utilization of the forest.

In this connection, work on truck trails during the year included 37.7 miles of new construction, the maintenance and improvement of 140 miles previously constructed, and the construction of 6 vehicle bridges; also, construction of 65 miles of new telephone lines and maintenance of 76 miles already completed; initiation of blister rust control on 2,853 acres of valuable sugar pine; and planting of 340 acres of trees and operation of a nursery for the propagation of forest seedlings with the present capacity of 1,500,000 trees annually.

The Wyoming camp handled the control of outcrop fires and has saved from destruction an inestimable amount of the Nation's coal resources in the vicinity of Little Thunder Basin, Wyoming.

The General Land Office is charged with the administration of approximately 325,000,000 acres of public domain in the Territory of Alaska, and on April 1, 1940, the Conservation Corps activities on these lands were transferred from the United States Forest Service of the Department of Agriculture to the General Land Office. It was originally contemplated that one-half of the enrollees used on this work would be white and one-half Alaskan Indians and Eskimos; however, due to the defense activities and consequent high labor wages, the number of white enrollees was reduced and authority was obtained to exceed the native allotment.

Office of Indian Affairs

Seventy-one Indian agencies in 23 States participated in the CCC program of work and training under the Office of Indian Affairs. Work projects included truck trails, firebreaks, telephone lines, horse and man trails, fences, springs, small reservoirs and water holes, wells, impounding dams, large reservoirs, range improvements, erosion control, water-spreading structures, stock trails, construction of lookout towers, vehicle and stock bridges, corrals, refuges for fish, waterfowl and animals and recreational facilities.

Every enrollee in CCC-ID has had the opportunity to become proficient in one or several occupational skills, through on-the-job training supported and augmented by related instruction during leisure time. General education subjects have included foremanship training, health instruction, elementary education, livestock management, correspondence courses, cooperatives, credit, and first aid. Many Indian enrollees, as a result of their training in CCC-ID, have been enabled to establish themselves in such reservation activities as farming and

the raising of cattle and sheep. Others have found employment in other Indian Service activities, the military services, or defense-connected industries.

Heavy equipment is operated and kept in repair by a staff of Indian mechanic's helpers who received their training on the job and in the shops. Practical training, on a production level, is given on such machinery as tractors, graders, rotary wheel scrapers, rock crushers, portable welders, compressors, and jackhammers.

Training in the interest of national defense, as well as in the interest of the CCC program, is being undertaken in cooperation with State departments of vocational education, as provided under Public Law 812. Courses have been approved for welding, metal work, telephone and radio maintenance and operation, and auto mechanics.

Work standards have improved; instruction and training are steadily enlarging individual and collective accomplishments; safety and health have been emphasized, both on the job and in the home. There is general improvement in morale and physical well-being. The CCC-ID program of work and training has attained the proportions of a necessity to the Indian people.

Bureau of Reclamation

The 44 CCC camps allocated to the Bureau of Reclamation during the year continued without change until May 1941, when the needs of national defense made mandatory the termination of the camp engaged on recreational development at Elephant Butte Reservoir in New Mexico. This camp was transferred to the Army for civilian work on a military reservation.

The year was characterized by a continuation of the rehabilitation and construction programs initiated in previous years. The reconstruction of water-control structures on canal systems, the building of operating roads along canal banks, the placing of gravel and rock riprap for erosion control, and an expansion of the weed-control program continued to make good progress.

On the Yakima project major structure betterments on the Sunny-side and Tieton divisions included the installation of reinforced concrete pipe and placement of creosoted wood-stave pipe to replace old wood-stave pipe in an advanced stage of deterioration. On the Rio Grande project work of considerable importance was accomplished at the Leasburg diversion dam where 35,000 cubic yards of material was excavated and backfilled in strengthening the dam. Placing of concrete pipe was a major activity on the Boise and Owyhee projects.

On new projects the CCC made good progress. The Deschutes project in central Oregon at the end of the year was 19 percent complete and all phases of construction, including the Wickiup Dam,

clearing of the Wickiup Reservoir, and the excavation of the main canal, were on or ahead of schedule. On the Central Valley project in northern California the enrollees were somewhat hampered in clearing the reservoir site behind Shasta Dam because of low company strengths, but at the end of the fiscal year had completed the clearing of 1,170 acres. On the Kendrick project in central Wyoming the end of the year saw the practical completion of the recreational development at Alcova Reservoir. A scenic highway has been completed along the north and west shore of the reservoir and parking facilities have been provided at the terminus of the road where conditions are suitable for swimming and boating.

In previous years the construction nature of the CCC activities on reclamation projects have lent themselves well to the development of training programs to enable enrollees to secure good jobs on leaving the corps. Recognizing the needs of national defense, greater attention has been given the training of enrollees and the number of boys leaving camps on reclamation projects with an adequate background of construction experience has been correspondingly increased.

Plans have been completed for the development of a number of small water conservation and utility projects, generally known as the Wheeler-Case projects, which will be constructed primarily by the CCC under direct supervision of the regular Bureau of Reclamation engineers and other technicians. Although at the end of the fiscal year no camps were in operation on these new projects, it is expected that by October, 12 camps will be in full operation.

National Park Service

The National Park Service operated in continental United States an average of 304 CCC camps, comprising 50,000 enrollees, on 190 State, county, and metropolitan parks, 90 national parks and monuments, 22 recreational demonstration areas, and 2 military areas. The Service's quota of 310 camps at the beginning of the year was reduced to 293 in the fourth quarter to make companies available for national defense purposes.

In the Nation's islands and territorial possessions the Service supervised the activities of 9 CCC companies with an authorized strength of 1,400 enrollees. One company worked in Hawaii National Park, 5 in the Territory of Hawaii, and 3 in the Virgin Islands. Some of these units were housed in regular CCC camps where the National Park Service provided both camp management and work supervision, while others functioned locally and required only work supervision.

During the last quarter 8 camps were operating exclusively on military areas, and 8 camps furnished details ranging from 25 enrollees to

full companies for temporary assignment to similar areas. In addition, 12 camps furnished 25 to 80 enrollees a day for periods of 6 to 8 weeks to develop 13 Army recreation centers or rest camps near metropolitan centers in 10 States and the District of Columbia. As further aid to national defense, 5 airports in 5 States were constructed, enlarged, or improved by CCC forces. Special selected training courses, related directly or indirectly to national defense, were available to enrollees on a voluntary basis, and regularly scheduled training courses in the various skills and techniques of general construction and development work were given to all enrollees.

Camps were terminated on 30 areas where recreational development had reached a stage sufficient to meet the essential requirements of the public, and camps were established and development begun on 13 new areas. Included in the latter group are Arches National Monument, Utah; Appomattox Court House National Historical Monument, Virginia; and Kolomoki Mounds State Park, Georgia.

Work projects on the continent and in the islands and territorial possessions continued on broad programs of conservation and recreational development. Conservation measures included fire prevention and suppression, reforestation and erosion control. The recreational programs involved the development of roads and trails, picnic and camp grounds, cabins, shelters and parking areas; bathhouses, bathing beaches, and lodges, and the construction of water and sewage systems.

Interesting national park jobs included the providing of winter sports facilities at Mount Rainier and Yosemite and trail relocations and the construction of shelters along the Appalachian Trail in Shenandoah and Great Smoky Mountains National Parks. In State and National historical areas the Corps carried on with its program for the stabilization, restoration, or reconstruction of important structures from old forts to Spanish Missions. Along the Blue Ridge Parkway in Virginia and North Carolina, and in Boulder Dam National Recreational Area in Nevada and Arizona, camps went on with work programs for the providing of recreational facilities.

Outstanding State area projects included a continuation of the restoration work at La Purisima Mission in California; completion of CCC work on the spectacular Red Rocks natural amphitheater near Denver, Colo.; preliminary jobs in connection with the proposed scenic highway along the palisades of the Hudson River on the New Jersey section of Palisades Interstate Park; recreational developments along the overseas highway from the Florida mainland to Key West; and continued development of such areas as Tyler State Park in East Texas, Florida Caverns State Park in Florida, and the Skokie Lagoons flood-control and recreation project near Chicago.

Grazing Service

The continued operation of 89 Grazing Service camps showed a progressive development of the natural resources of the Federal range, and further emphasized the rehabilitation and conservation of youth. The construction program and preventive measures designed to conserve and improve the land and soil followed the general pattern of former years to facilitate the control and use of lands under the Service in the States of Utah, Nevada, California, Oregon, Idaho, Montana, New Mexico, Colorado, Arizona, and Wyoming.

The improvement of natural water supplies, such as springs and seeps and the development of sources from underground water tapped by well developments, or by utilizing run-off waters guided into and impounded in storage reservoirs, has greatly increased the water resources for animal consumption and improvement of the forage cover. Fencing of range areas to facilitate control and use of lands and the construction of truck and stock trails have aided considerably in the administration and use of the lands.

While it may be stated generally that the primary concern is to utilize the facilities of the CCC to conserve and strengthen the natural resources of the Federal range, the efforts of the Corps under operation of the Grazing Service have been expended in a large measure in beneficial aid during emergency conditions, such as sighting the wreck of a large Army bomber in Nevada and communicating with Army authorities by means of CCC radio field equipment; assistance in fire fighting and relief tendered to communities and inhabitants during the New Mexico flood.

The truck trails constructed have been helpful in the mining of strategic war minerals and in providing access to bombing areas on Federal range.

Fish and Wildlife Service

There was no change during the year in the number, location, and general work objectives of the CCC camps assigned to work on wildlife refuges. Thirty-six camps continued development work designed to improve wildlife habitat and to provide essential facilities for administration on 34 National and 1 State wildlife refuge in 25 States. Since the establishment of the Corps, 2,233 camp months of CCC labor have been used exclusively for the development needed on 44 of the more important refuges and, with side camps and detachments, needed improvements have been made on 22 other areas.

The work at Lower Souris Camp FWS-4, North Dakota, may be cited as typical both of work accomplishments and of the outstanding opportunities provided for the training of young men for places in industry and noncombatant defense posts. Work completed during

the year on this area included the construction of a dam and the placing of 1,600 square yards of rock riprap on previously constructed dykes; the construction of three vehicle bridges, a sewage disposal system, and a number of miscellaneous structural improvements. Thirty-three miles of boundary fences were erected and about 6 miles of truck trails were added to the refuge patrol roads. About 39,000 trees were transplanted for windbreaks and wildlife shelters; 1,700 man-days were devoted to the development of a nursery, and 2,670 pounds of seeds of food- and cover-plants and 290 pounds of tree seeds were collected. Intensive forest stand improvements covered more than 200 acres.

At each of the 36 camps, on-the-job training was given in connection with projects such as these and this training was correlated with classroom instruction to fit the young men for important behind-the-lines defense posts. More than 500,000 enrollee-hours were devoted to training in the field and approximately 250,000 hours were given to classroom instruction after working hours. On the average, each camp gave 10 classroom courses and 87 percent of the supervisory personnel participated in the teaching program.

In May a company of veteran enrollees was assigned to work on the Fort Sill Military Reservation, Oklahoma, and throughout the year detachments of enrollees from Back Bay Camp FWS-1, Virginia, helped to prepare the Fort Story Military Reservation, Virginia, for occupancy by National Guard and Selective Service trainees.

CCC Safety

"Accidents Must Stop" sums up the attitude toward personal safety of each CCC cooperating agency in the Department of the Interior. As a result, several camps under the supervision of the Department's bureaus and offices operated through the entire year without a single lost-time or fatal accident.

For all the Department's camps during the year there was an 18 percent reduction in the lost-time accident frequency rate and a 34 percent reduction in the severity rate as compared to the figures for 1940. In 1941 there were only 11 accidental deaths; in 1940 there were 24.

To the Bureau of Mines for its helpful cooperation in the training, examination, and certification of personnel for the handling of explosives, the CCC technical agencies are grateful. Under this Bureau's guidance it has been possible to establish a procedure which prevents any man from supervising blasting activities until he has been certified by the Bureau's examiners.

Each Bureau's safety representative has contributed a great deal toward making a success of the Department's Safety Bulletin, a

quarterly which has stirred up considerable interest among the men in the field. This year's "True and False" safety tests were especially effective.

A reduction of 25 percent in the lost-time accident frequency rate for the fiscal year 1941 as compared to 1940 was the record of the Fish and Wildlife Service. The Tulelake camps completed 41 months without a lost-time accident as of June 30, 1941. One enrollee truck driver at the Hart Mountain camp has driven 152,000 miles without an accident.

The camps under the supervision of the General Land Office had a reduction of 28 percent in lost-time accident frequency rate and 52-percent reduction in the severity rate for the year as compared to 1940.

The number of lost-time man-days on Grazing Service projects arising from serious accidents during the fiscal year 1941 as compared with the number lost during 1940 shows a decline of some 27,000 days.

A reduction of 25 percent in the lost-time accident frequency rate and a reduction of 55 percent in the severity rate for the year as compared to 1940 was the record of the camps under the supervision of the National Park Service. Region three set a new accident frequency record for all the regions of the Service.

An improvement of 21 percent in the lost-time accident frequency rate and 43 percent in the severity rate for 1941 as compared to 1940 was the accomplishment of the Bureau of Reclamation. Eight of the 44 CCC camps under their technical supervision operated the entire year without a lost-time or fatal accident.

Considerable attention has been directed by the Office of Indian Affairs toward first-aid instruction in cooperation with the national defense training program. Five district first-aid and safety conferences were held at various points. These conferences were attended by 116 men, of which 89 qualified as first-aid instructors. Agency safety councils have been organized in 45 Indian agencies.

Division of Territories and Island Possessions

RUPERT EMERSON, Director ¹

WORLD CONDITIONS, as they exist today, have served to focus attention more sharply than ever upon the territories and island possessions of the United States which are serving as bastions to the defense, not only of the United States, but of the Western Hemisphere.

In the Caribbean east of the Panama Canal lie the islands of Puerto Rico and the Virgin Islands upon which have been, and are being, constructed strong naval and aerial fortifications serving as key defenses to the vital passage between the Atlantic and Pacific Oceans.

The Territory of Hawaii has, as a bulwark to our national defense, one of the strongest naval bases of this country. It has, during the past year, been greatly strengthened not only as a naval fortress but also as a base for aerial reconnaissance and defense.

The sum of \$25,000,000 paid for the Virgin Islands in 1917 and \$7,200,000 paid for Alaska in 1867 was certainly a small price to pay for the protection these areas are now affording this Hemisphere.

The world conflagration, spreading as it is over the continents of Europe and Asia, is bringing closer to national attention the nearness of our northern Territory of Alaska to the battlefields of the world via Soviet Russia, which lies but a bare 30 some odd miles from the nearest point of the Alaskan shore. Our national leaders have realized the possibilities of attack from this direction and are bending every effort to establish suitable aerial and naval bases in the Territory. At Anchorage and Fairbanks huge airfields are nearing completion at which will be stationed strong forces of all types of fighting planes. At Kodiak, Unalaska, and Sitka, the Navy Department is seeing to it that bases are available for operations of the fleet in these waters if it should be necessary.

¹ While Mr. Emerson served as Director of the Division of Territories and Island Possessions during the 1941 fiscal year, Mr. Guy J. Swope, Governor of Puerto Rico, was appointed Director of the Division on July 24 and entered upon his duties in that post on August 7.

Also focused in the headlines are the Philippine Islands, lying in the present pathway of Japanese expansion to the south. This commonwealth will inevitably be drawn into the maelstrom of world conflict in the event of hostilities between Japan and the United States.

The Division of Territories and Island Possessions is playing an important part in coordination of various Government agencies in the work they are doing in these far-flung areas of national importance. In Alaska, The Alaska Railroad and the Alaska Road Commission are called upon to render considerable service to the War and Navy Department activities. The Consolidated Purchasing and Shipping Unit at Seattle is greatly taxed in the purchase of supplies and equipment for many new agencies which have established offices in the Territory as a part of national defense.

Territory of Alaska

To the two main industries of Alaska—gold mining and salmon fisheries—which heretofore have constituted the main economy of the Territory, has been added the defense program. The prospects for the economic growth of the Territory are better than they ever have been, and the quickening effect of Federal policies has been widely felt throughout Alaska.

The War and Navy Departments and the Civil Aeronautics Administration have instituted wide-flung projects as a direct aid to the military defense of this area. The War Department is primarily concerned with the construction of new air bases, and their program is closely allied with the intermediate landing fields and airways traffic signals being prepared by the Civil Aeronautics Administration. The Navy Department of course is engaged in the preparation of suitable naval stations at strategic points.

The last decennial census indicates a population of 72,524. The count was taken in October 1939, whereas the census in the United States proper was taken 6 months later. During these 6 months a further marked increase took place, owing to the large-scale national defense program. It may safely be assumed that had the census been taken on April 1, as elsewhere, an increase of at least 30 percent would have been registered. In the months following a still further increase took place, and before the expiration of the current year the population of Alaska will have passed 80,000 people, an increase of 35 percent over 1930.

The rapid increase in population in the Territory, without accommodations of any kind having previously been prepared to receive them, has caused a tremendous increase in the cost of living throughout Alaska. A recent exhaustive study made by the National Federation of Federal Employees at Juneau reveals that the cost of living

as compared with Washington, D. C., is 36 percent higher in Ketchikan, 49 percent in Juneau, 60 percent in Sitka, 71 percent in Cordova, 89 percent in Anchorage, and 116 percent in Fairbanks.

Mines in Alaska produced minerals worth \$28,470,000 in 1940, as compared with \$25,296,000 in 1939, an increase of about 12 percent. The total value of minerals produced in 1940 was greater than in any other year except the 4 years of the First World War, 1915 to 1918. This increase is not regarded as being due to unusually favorable conditions that may not soon be repeated but appears to mark a level that can be maintained and bettered under such normal conditions as may reasonably be expected. The following table shows the value of the mineral output of Alaska for 1940 as compared with 1939:

	1940	1939
Gold.....	\$26, 178, 000	\$23, 279, 000
Silver.....	143, 000	138, 000
Copper.....	13, 800	30, 000
Lead.....	84, 000	106, 000
Platinum metals.....	1, 093, 000	997, 000
Tin, metallic.....	52, 000	37, 300
Coal.....	695, 000	585, 000
Miscellaneous mineral products, including antimony, limestone, quicksilver, etc.....	211, 200	123, 700
Total.....	28, 470, 000	25, 296, 000

Gold, of course, exceeded all other minerals in value and the amount produced in 1940 marked an all-time high, surpassing even the so-called "boom days" of the great gold rush to Alaska.

For many years the Alaska fisheries have been the principal revenue-producing industry in the Territory. However, for 1940 the total quantity was the smallest for any year since 1927. Two important causes of the decline were light runs of herring and salmon in certain localities which necessitated rigid curtailment of operations in order to rebuild the populations to their normal abundance, and suspension of operations by the Alaska whaling stations because of the low prices for whale oil. The total value of Alaska fishery products was \$36,440,660, a decrease of \$3,663,833 from the preceding year. These figures represent the value of the manufactured products.

The combined wildlife resources of Alaska are estimated roughly at \$100,000,000. Last year 546,295 pelts were taken in the Territory. The value of those shipped out totaled \$1,944,719. However, this value was approximately \$700,000 less than 1939.

The financial condition of the Territorial Treasury is indicated in the following statement:

Net cash balance on hand January 1, 1940.....	\$656, 685. 82
Receipts.....	3, 739, 190. 57
Disbursements.....	3, 758, 439. 48
Net cash balance, December 31, 1940.....	637, 436. 91

Aggregate banking figures for both national and territorial banks were as follows:

Capital.....	\$985, 000
Surplus and net undivided profits.....	1, 382, 483
Deposits.....	22, 110, 699

Deposits show an increase of \$4,962,146 over the previous year.

The Alaska Railroad

The passenger train schedule during the summer of 1940 provided for three round trips per week between Seward and Fairbanks, with supplementary service out of Fairbanks to Nenana and McKinley Park, and out of Seward to Anchorage. Passenger train service was reduced to one round trip each week in September. On June 2,



AMERICA'S NORTHERNMOST DEFENSE LINE

Treasure house of natural wealth, strategic link in the armor of national defense, Alaska is the northernmost point of the United States under the administration of the Division of Territories and Island Possessions. An Alaskan Railway train adds picturesque action to the spectacular scenic panorama of snowcapped mountains and green hills and valleys.

1941, the summer passenger train schedule was again inaugurated consisting of three round trips each week between Seward and Fairbanks with supplementary service during the month of June.

River boat service was maintained during the season of river navigation with bimonthly sailings from Nenana to Tanana, Ruby, Holy Cross, and Marshall.

Both passenger traffic and freight tonnage over the railroad showed a noteworthy increase for the year due to the defense construction activities in Anchorage and Fairbanks.

The Alaska Road Commission

The work accomplished during the fiscal year is summarized as follows:

New construction: 72½ miles of road of which 35¾ miles were surfaced, 3¾ miles of sled road, 106 miles of trail, one 180-foot span steel bridge, 350 linear feet of suspension span footbridge and 1,386 linear feet of timber trestle bridges.

Improvement: 44¼ miles of road regraded and widened, 105 miles of road surfaced, 528 metal culverts averaging 20 feet in length installed principally as replacements for wooden culverts.

Maintenance. 2,022¼ miles of road, 139¼ miles of tramway, 554¼ miles of sled road, 977½ miles of permanent trail, and 224 miles of temporary flagged trail.

The cost during the year was \$991,967, of which \$276,294 was for new work and \$715,673 for maintenance and improvement. Total expenditures during the fiscal year were \$1,212,995.

Alaskan Insane

At the beginning of the year there were being cared for at the Morningside Hospital at Portland, Oreg., 310 insane patients of Alaska. During the year 53 additional patients were received. There were 20 deaths among the patients, 9 transferred, 32 discharged, and 3 paroled, a net decrease of 11 for the year. As of June 30, 299 patients were under care at the hospital.

Territory of Hawaii

The past year has been an eventful one in the Territory of Hawaii. The importance of Hawaii in the scheme of national defense has been fully realized and the construction of defense projects throughout the islands and particularly on the island of Oahu has proceeded apace. Thousands of defense workers have been brought in from the mainland of the United States and their presence here, coupled with the great

increase in Army and Navy personnel, has presented many problems to the civilian community. Two of the most pressing are those relating to highway traffic and adequate housing.

The various county governments in the Territory have established disaster relief or defense councils in their respective counties, and in an effort to coordinate their work and advise the Governor in home defense matters, the Governor on June 20, 1941, appointed a Territorial Advisory Defense Council.

The Selective Service and Training Act was put in operation in Hawaii on September 23, 1940. Total registrations as of June 30, 1941, numbered 61,837. Of this number 69 percent were citizens and 31 percent aliens. Inductions totaled 1,692 selectees. Hawaii has, in addition to this number of selectees to its credit under the Selective Service Act, the Hawaii National Guard, Reserves and men in the Army, Navy and Marine Corps, totaling 2,611, or a grand total of 4,004 men in the several services.

Since the Territory imports over two-thirds of its human and animal feed, it is apparent that any restriction in shipping facilities from the mainland would indicate the need for a large increase in local production. On June 20, 1941, the Governor appointed a committee to aid and advise in the discharge of duties incumbent upon him under special law of 1918 with reference to studies made for production, storage, and distribution of food in the Territory. In its recommendations to the Governor, the committee stressed the need for approval by the Bureau of the Budget of the purchase of designated mainland foodstuffs for surplus storage in Honolulu and for both Federal authority and emergency funds to implement the local plans.

The legislature was in session from February 19, 1941, to April 30, 1941. Of the 1,197 measures which were introduced, 355 became law. Among the important measures which became law were acts revising the liquid fuel tax act, governing labor disputes between public utilities companies and their employees, making criminal certain acts of sabotage, requiring territorial and county officers and employees to take an oath of loyalty, revising the Hawaii unemployment relief and welfare tax act, revising the unemployment compensation law, etc.

During the year the population of the Territory increased by 9.4 percent, bringing the total estimated population on June 30, 1941, to 466,924. During the previous year the increase was only 2.81 percent. This large influx and corresponding increase in trade is reflected in internal revenue receipts for the year, which amounted to \$13,763,998, an increase over the previous year of more than \$4,000,000. The total receipts exceeded those of any one of 12 different States.

The value of permits issued by the building inspector's office of the city and county of Honolulu, for new construction, alterations, addi-

tions, and repairs, amount to \$11,537,248. This figure is exclusive of the many millions of dollars expended by the United States Government on Army and Navy construction projects and is an indication of the greatly increased building required to take care of the huge influx of defense workers.

Total commerce of Hawaii for the calendar year 1940 amounted to \$238,506,066, an increase of more than \$14,000,000 over the previous year. A break-down of the above figure shows imports from foreign countries valued at \$7,999,062; from mainland United States, \$127,439,539; exports to foreign countries, \$922,335; to mainland United States, \$102,145,130. Sugar and pineapples remained the principal items of export.

During the year 1,667 vessels in the overseas trade, of a gross tonnage of 11,893,803 tons, arrived at Hawaiian ports, carrying inward 2,919,547 tons of freight and 43,338 passengers.

Considerable activity has taken place on Territorial airports during the past year, largely due to the cooperation of the Work Projects Administration and the Civil Aeronautics Administration.

During 1940 broad expansion programs were conceived and undertaken by the larger utility concerns serving the island of Oahu.

All phases of public school work are affected by the national and community reactions to the present emergency. Enrollment of pupils has increased due to enrollment of children of defense workers and children of the armed forces. During the past 2 years the number of children from such families in the Oahu schools alone has increased by more than 1,000.

The financial condition of the Territory continued excellent. Cash balances of all funds in the Treasury on June 30, 1941, amounted to \$19,606,277, an increase of 35.65 percent over the balances on June 30, 1940. The net assessed valuation of real property totaled \$188,055,-642 and of personal property was \$94,910,426.

Provisional vital statistics rates show that 1941 was an outstanding year for public health, with the rates for crude mortality, infant mortality, and stillbirths being the lowest yet recorded.

Puerto Rico

Puerto Rico is at present experiencing a period of great prosperity, due largely to the national defense program, which is now in full swing. Construction projects connected with these activities have, for the time being, virtually done away with the island's unemployment problem. The finances of the insular government are in excellent condition. At the close of the fiscal year, the general fund showed a balance of \$6,447,843.39, an increase of \$3,594,511.64 over the preceding year. Its bonded indebtedness was reduced by \$225,000. Depos-

its in the banks increased from \$76,373,845.68 in 1940 to \$86,654,-834.21. Bank loans and investments totaled \$46,594,667 as compared with \$37,174,610 the preceding year.

Exports to the continental United States and to foreign countries amounted to \$86,304,852 and \$1,413,799 (first 11 months), respectively, or a total of \$87,718, 651. Imports from the United States and foreign countries amounted to \$100,956,780 and \$7,076,969, respectively, or a total of \$108,033,749.

Under a joint resolution passed by Congress in 1900, every corporation engaged in agriculture was restricted to the ownership and control of not to exceed 500 acres of land. No penalties for its violation were provided and hence over a period of 40 years vested interests grew up, which owned or controlled thousands of acres, with no attempt on the part of the Government to enforce the law. This being deemed detrimental to the welfare of the people of Puerto Rico who, according to the last census, numbered 1,869,255, suits were brought against various sugar corporations operating in the island. A decision having been rendered in favor of the Government by the United States



CONSERVATION IN THE TROPICS

Puerto Rico, under the administration of the Division of Territories and Island Possessions, presents many problems of conservation and defense in areas such as the pastoral La Plata Valley.

Supreme Court, it became necessary to ascertain how the law could be enforced in the interests of the public, the island, and all parties concerned. For the purpose of investigating this vital problem, Rexford Guy Tugwell was selected as a special adviser to the Secretary of the Interior, and accompanied by a group of technical experts and assistants, visited Puerto Rico where hearings were held. It is expected that Mr. Tugwell will render a report shortly, which will be used as a basis for initiating the policy to be followed in discharging responsibilities growing out of the five-hundred-acre law and the need for further Federal action.

Having accepted appointment by the President as Ambassador to France, Admiral William D. Leahy resigned as Governor of Puerto Rico, December 5, 1940, and was succeeded by Guy J. Swope, former Auditor of Puerto Rico, who qualified for the office on February 3, 1941. Patrick J. Fitzsimmons succeeded Mr. Swope as Auditor, effective May 21, 1941. Two Associate Justices of the Supreme Court of Puerto Rico, with approximately 36 years service each resigned the latter part of 1940. One vacancy was filled by the appointment of Roberto H. Todd, Jr., who took the oath of office on February 21, 1941.

The work of adjusting the hurricane relief loans made by the former Puerto Rican Hurricane Relief Commission has been continued. Loans adjusted to June 30 number 444. Originally made in the sum of \$1,503,107, these loans have been adjusted, according to the ability of the borrower to pay, for \$436,144.28. This sum plus previous payments amounting to \$16,517.79, or a total of \$452,662.07, will revert to the Federal Government. Adjustments and previous collections approximate 30.11 percent of these original loans. Some 2,070 loans remain to be adjusted. Eight employees are engaged in this adjustment work.

Virgin Islands

The national-defense activities in the Virgin Islands have served to bring attention of everyone concerned to the need for broadening the economic life of the Virgin Islanders. Their main dependence heretofore has been the growing of sugarcane and to a small extent the raising of cattle. The economic structure of the island of St. Croix rests entirely on agricultural pursuits. Shipping activities of the island of St. Thomas serve as the main source of income for the population of that Island.

It is believed advisable to bring again to the fore the two handicaps under which the island of St. Croix must suffer with reference to the growing and processing of sugarcane. It has been stressed before, but we wish to stress again that of all American sugar producers, the

Virgin Islands, are the only ones who do not get sugar benefit payments from the United States Government. Also no other American sugar producers are required to pay a sugar export tax which in St. Croix amounts to \$6 per ton. If some remedial legislation were passed the economy of the populace of St. Croix would be largely augmented.

There are two phases of economy in the Virgin Islands that are now undergoing intensive study. One is a movement toward increasing the number and improving the breed of cattle to provide food not only for the native Islanders but also for large contingents of Army and Navy personnel. From funds made available by the Public Works Administration, there has been constructed a modern abattoir large enough to take care of all local requirements providing a sufficient number of cattle can be raised for this purpose. A hardier type of breeding stock is being introduced and it is planned to create a cooperative for their feeding and marketing. It is believed that with efficient supervision the cattle industry of the Islands can be greatly increased.

Another project of potential benefit to the community, particularly in view of the great demand for foodstuffs caused by defense activities is the modern market of St. Thomas now under construction and planned for completion by January, 1942. Financed by Public Works Administration funds, the plant will include a modern market and cold-storage building, a building for fish cleaning and poultry dressing, as well as necessary water supply and dock appurtenances. The operation of this market will be coordinated with the operation of the new abattoir in St. Croix within the framework of the Virgin Islands Co.

The past year has been one of the greatest on record as far as the island of St. Thomas is concerned. As stated before, the shipping business is the chief economic asset of St. Thomas and upon which the well-being of most of its population depends. A total of 1,220 ocean-going vessels called at the port of St. Thomas during the year in comparison with 985 in 1940 and a 10-year (1931-40) average of 659. Foreign cruise ships, heretofore the Island's chief dependence for its tourist trade, were withdrawn at the outbreak of hostilities in 1939. They were partially replaced by American cruise ships which, too, by the end of the fiscal year had been withdrawn for naval service. The bunkering business and transshipment of bauxite is limited only by the capacity of the dock plant to take care of it.

Employment in the islands during this fiscal year has taken every employable male worker to operate the various defense and WPA projects. In addition, hundreds of workers were imported in St. Thomas from neighboring islands to work on defense activities which further complicated problems of health, housing, sanitation, and transportation.

One of the principal problems to be met during the coming year

is that of sanitation. Medical and sanitation facilities, although much improved in recent years, are still too nearly primitive. Open gutters in all towns, inadequate garbage and refuse disposal, primitive sewage-disposal methods, limited modern sewage facilities, all constitute a potential menace to community health, which it is proposed to alleviate as much as possible in the very near future.

During the year Lawrence W. Cramer, who had been Governor of the Virgin Islands since August 31, 1935, resigned as Governor and was succeeded by Charles Harwood of New York who took the oath of office on February 3, 1941.

The Philippine Islands

The Philippines have assumed increased importance in our national-defense program and several of the measures enacted by the Congress to strengthen this defense program include the Philippine Islands. Among the most important of these measures was the amendment of the Export Control Act to include the Philippines, thus enabling this Government to control the exportation from the islands of materials necessary for our national defense. Although Philippine internal economy has been seriously threatened by the extension of this measure through the resultant curtailment of exports, Commonwealth officials have loyally cooperated with the United States in meeting the present emergency. In his annual message to the Philippine National Assembly on January 31, President Quezon stated:

The Filipino people, desirous of cooperating with the United States in the execution of this defense program, are ready to bear their full share of that responsibility. To this end, I have assured the government of the United States, in behalf of the Commonwealth, that the entire Philippines—its man power and material resources—are at the disposal of the United States in the present emergency.

On the assumption that the Commonwealth would be unable to market its sugar, due to the shortage of shipping facilities for other than strategic war materials and the increased freight and insurance rates, bills were introduced in both Houses of Congress to amend the Sugar Act of 1937 so as to enable domestic areas to participate in the reallocation of any deficit in the Philippine quota. As passed by the Senate, the bill would allot 75,000 short tons of such deficit to foreign countries other than Cuba and the remainder to domestic sugar-producing areas. A somewhat similar measure is under consideration in the House. Another bill, introduced in the Senate and still pending, would suspend for one year, commencing July 1, 1941, the export taxes on Philippine products prescribed in the Independence Act of March 24, 1934, as amended in 1939. A resolution of the National Assembly had petitioned for the suspension of both the export taxes and the provisions of that act providing for decreasing quotas of certain commodi-

ties, such suspension "to remain effective during the duration of the present emergency or until the President of the United States shall, by proclamation, order otherwise." The reasons given for making the petition were that the extension of the Export Control Act would close certain foreign markets to their principal exports, that under the conditions at present prevailing in the Philippines as a result of the present wars the tax and quota provisions of the Independence Act would "seriously undermine the Philippine industries affected, thereby causing widespread unemployment, serious social unrest and human suffering, and a drastic reduction of government revenues", and that the present wars have so disturbed Philippine economic conditions as to affect adversely the economic readjustment program essential to preparation for independence in 1946 as contemplated by Congress in the Act of 1934.

The President's Executive order of April 10, 1940, bringing the funds of certain foreign countries under control, as amended from time to time, has been enforced in the Philippines by the United States High Commissioner as the President's representative.

The total external trade of the islands during the calendar year 1940 amounted to \$290,655,795. This figure includes gold and silver exports valued at \$38,876,748, approximately all of which came to the United States. Of the total trade, \$234,384,812 represented trade with the United States. Shipments from the United States to the islands during the year were valued at \$105,207,854. The Philippines ranked ninth as a customer of the United States as compared with fifth place in 1939, being preceded, in the order named, by the United Kingdom, Canada, France, Japan, Brazil, Argentina, Union of South Africa, and Mexico. Philippine shipments to the United States, including gold and silver, were valued at \$129,176,958, which amounted to 83 percent of all exports.

As a result of free trade between the United States and the Philippines, the latter have developed an economy very largely dependent upon the export of relatively few commodities to the United States. The theory of the Independence Act was that the Philippines should be given an opportunity to seek further outlets for their important commodities. The war, however, has to a large extent cut off the normal foreign trade of the Philippines with countries other than the United States, and the shortage of shipping and tremendous increase in freight rates are seriously hampering trade with the United States. In addition, the extension of our Export Control Act to include exports from the Philippines has still further reduced their opportunities for foreign trade. Certain commodities such as hemp, manganese, chrome ore, and to a certain extent coconut products, rank high in the list of strategic materials badly needed in our defense program, but the prospects for other commodities are gloomy indeed. A very large

percentage of the population of the Philippines is directly or indirectly dependent for their livelihood on the production of sugar and coconut products. If, as a result of the war and shortage of shipping, the exportation of these two commodities is seriously curtailed, an economic situation of the utmost gravity will be brought about. There is not only danger of great distress to the population but there is also the possibility of serious social disturbances. This Department is making every effort to secure as favorable treatment for the Philippines in the matter of shipping as is consistent with our national defense program, but it seems almost certain that the strain which will be placed on Philippine economy will require serious attention by this Government.

During the year ended June 30, 1941, payments in total amount of \$6,609,120.20 were made by this Division from funds of the Philippine government. Of this amount, \$800,204.29 was for supplies purchased in the United States and shipped to the Philippines, \$2,516,296.45 was for the purchase of Philippine Government bonds, \$2,515,277.50 was for interest on the Philippine public debt, and the remaining \$777,341.96 was for salaries and expenses of Philippine employees, and other miscellaneous items. During the year Philippine bonds to the face value of \$6,827,000, purchased from sinking funds, were canceled and the outstanding Philippine public debt reduced by that amount.

National Assembly of the Philippines

The National Assembly convened in special session on July 8, 1940, primarily to canvass the returns and certify the results of the plebiscite held in June to pass on proposed amendments to the Philippine Constitution, and adjourned on August 10. The most important of the 28 bills passed made provisions for defense of the Philippines and granted to the President of the Philippines broad emergency powers to act with dispatch in case a tense situation should arise. These powers would permit the Chief Executive to suppress espionage and other subversive activities, commandeer ships, control industrial establishments, regiment all able-bodied citizens not engaged in useful occupation for services required by the public interest, prevent hoarding and profiteering, prohibit strikes, etc. Several measures were devoted to educational reforms.

Among the measures that required and received the approval of the President of the United States were the immigration law, which became effective January 1, 1941, amendments to the Internal Revenue Code, and amendments to the Philippine Constitution. One of the constitutional amendments reduces the tenure of the President and Vice President from 6 years without reelection to 4 years with one reelection. Another replaces the present unicameral Assembly with a bicameral Congress through revival of the Senate to be composed of

24 members. The terms of office of the President, Vice President, and of the legislators will begin on December 30, 1941. A third amendment establishes a Commission on Elections to take charge of the enforcement and administration of all laws relative to the conduct of elections.

The final regular session of the unicameral Assembly was held from January 27 to May 22, 1941. It enacted several measures arising from the approval of the constitutional amendments, such as providing for the first election of President and Vice President and members of the Congress of the Philippines, and making changes in the conduct of elections. In addition to appropriations for general purposes and for public works was an act providing for a \$10,000,000 bond issue for public works. Provision was also made for several provincial bond issues. Among the national-defense measures approved were an espionage act modeled on the American act, and a compulsory alien registration act. Laws for the protection of the civilian population against emergencies included an appropriation of \$5,000,000 for civilian defense and the prohibition of exportation of food products.

Equatorial and South Sea Islands

Four men continued to be stationed on the four islands of Jarvis, Howland, Baker, and Enderbury during the year, with one of the employees of the Pan-American Airways acting as departmental representative on the island of Canton. Three expeditions were made to the islands to carry food, water and other supplies to the colonists and to make personnel replacements.

United States Antarctic Service

In November 1939, a Government-sponsored expedition sailed from the United States for "the investigation and survey of natural resources of the land and sea areas of the Antarctic regions." Two ships carried the expedition personnel, totaling 135, and the vast tonnage of supplies and equipment necessary to the mission.

Two base camps were established on the Antarctic Continent, in the Pacific and American Quadrants respectively, and a full year's intensive program of exploration and scientific research, both in the field and at the camps, was carried out. Approximately 2,000 miles of continental coast line was discovered and mapped on aerial and dog-sledge thrusts into previously unknown areas, and scientific parties, venturing far afield, pursued research work in geology, glaciology, meteorology, biology, ornithology, magnetism, cosmic ray, and many other scientific fields.

The expedition returned to the United States in May 1941, the

ships were released to other uses, and the personnel partially demobilized. The scientific staff of the expedition was retained in the service and is currently engaged in compiling reports on the results of the expedition's activities, both exploratory and scientific, to be incorporated in the official history of the undertaking, which will eventually be published as a public document.

Puerto Rico Reconstruction Administration

MILES H. FAIRBANK, Acting Administrator

THE Puerto Rico Reconstruction Administration was established by Executive Order No. 7057 of May 28, 1935, to "initiate, formulate, administer, and supervise a program of approved projects for providing relief and work relief and for increasing employment within Puerto Rico." For this program funds aggregating \$69,904,000 have been made available to the PRRA by allocations from appropriations contained in the Emergency Relief Appropriation Act of 1935 and succeeding years, and by direct appropriations to the PRRA contained in the Emergency Relief Appropriation Acts of 1938 and 1939, and the Emergency Relief Appropriation Act, fiscal year 1941.

During the first 5 years of its existence, the PRRA initiated extensive projects involving both relief and permanent reconstruction in rural rehabilitation and resettlement; organization and financing of sugar mill and agricultural cooperatives; construction of a cement plant for the insular government; development of hydroelectric, irrigation and other projects of rural electrification; construction of roads and other useful projects in cooperation with the Army and Navy and insular and municipal governments; health and sanitation work, including swamp drainage, malaria control, and construction of water-works and hospitals; educational projects including community centers, social service work, and the construction of numerous school buildings.

Aid in National Defense

Although the PRRA program was initiated primarily to relieve unemployment distress, and to do this in part through projects of rural rehabilitation, much of its work contributed to foundations for national defense. Since the island of Puerto Rico has always depended mainly on imported foodstuffs for the nourishment of its inhabitants, the encouragement given by the PRRA through loans and supervision for the growing of subsistence crops, has produced a

substantial increase in bananas, plantains, sweet potatoes, and vegetables available for local consumption. The groundwork for expansion of food production has been well laid.

Similarly, the PRRA's housing program provided a stimulus to extensive building by private capital which has enabled the island to meet the growing demand for living accommodations by the thousands of Army, Navy, and other personnel who have come to the island because of defense activities.

Roads and bridges built by the PRRA have facilitated transportation and have been important links in highway facilities since undertaken by other agencies. Unquestionably, the rural electrification program of the PRRA likewise has been of great help in the defense program, making work possible both night and day. With completion of the Dos Bocas Dam project, there should be no lack of sufficient electric power for the general defense establishments of the island.

The cement plant, capacity of which has recently been almost doubled, has been providing high quality cement for defense needs, and the butyl alcohol and acetone plant at Lafayette is producing much needed solvents for war industries. In addition, PRRA's aerial map section supplied the Army and Navy, the WPA and insular government with 386 different prints for use in connection with national-defense projects.

Above all, the cooperative educational program has stimulated thinking and leadership qualified to cope with problems which may arise if steamship connections with the mainland are reduced or cut off.

Operations in 1941

For the fiscal year 1941, activities of the PRRA necessarily were greatly limited in scope by the fact it had available only about \$5,200,000 (as against nearly \$9,000,000 the preceding year), consisting of \$4,000,000 directly appropriated by the Emergency Relief Appropriation Act, fiscal year 1941, together with unobligated balances under previous appropriations extended for availability, and approximately \$450,000 used for projects approved for expenditure out of the revolving fund created by the act of February 11, 1936 (49 Stat. 1135). Funds available were obligated in round figures for the following purposes:

Rural electrification, Dos Bocas project.....	\$1, 960, 000
Loans to farmers and cooperatives.....	600, 000
Liquidation of rural rehabilitation program.....	389, 900
Soil conservation.....	400, 000
Construction of resettlers' houses.....	368, 000
Cattle tick eradication.....	232, 500
Forestry.....	200, 000
Administration.....	236, 190

Housing management and repair.....	\$160, 000
Operation and disposition of lands at Lafayette.....	263, 800
Miscellaneous items, principally to terminate previous years' projects.....	330, 298
Total.....	5, 140, 688

Since December 1940, when Admiral William D. Leahy was appointed ambassador to France and resigned as Administrator, Miles H. Fairbank, Assistant Administrator, has been Acting Administrator of the PRRA. A summary of accomplishments for the fiscal year 1941 follows:

Rural Electrification

In conformity with the report of the House Appropriations Committee, \$1,960,000 out of the \$4,000,000 in new funds appropriated by Congress was earmarked for completion of the Dos Bocas project; as of June 30, 1941, it was 92 percent complete. Certain heavy power machinery purchased could not be delivered or installed by June 30 because of priority regulations. In the main dam, retaining walls and dam apron, about 176,000 cubic yards of concrete were poured; construction of a powerhouse and foundations for the turbogenerators are well advanced. About 3 miles of an insular highway, covered by the reservoir area, were relocated and opened to traffic. Funds for the final completion of the project will, it is believed, be provided by the insular government. It may be of interest in this connection, to note that the PRRA since its inception, has expended approximately \$9,207,000 for hydroelectric projects in the island, and about \$200,000 more for 22 miles of transmission and 53 miles of distribution lines. Federal funds, accordingly, have made a most substantial contribution to the island's hydroelectric development.

Rural Rehabilitation

Limitation of available funds required that the previous extensive program be placed on a basis of gradual liquidation, looking to the termination of previously planned land acquisitions for establishment of needy resettlers, construction of only a limited number of resettlers' houses, waterworks and other incident facilities, cessation of activities of the central service farms, and the sale of surplus livestock acquired for distribution as part of previous programs.

Under commitments made in previous fiscal years, title was vested in the Government to 880 parcels of land, and 1,025 needy persons were established as resettlers. The number of resettlers' homes constructed since the beginning of the program was increased to 5,496 by the building of 1,020 additional houses during the fiscal year. Of these, 171 concrete houses at an approximate average cost of

\$900, and 390 corrugated-iron houses at an approximate average cost of \$680 were completed with funds made available by earlier appropriations. The Emergency Relief Appropriation Act for the fiscal year 1941 contained a special restriction to \$750 of the cost of the construction of any dwelling undertaken in connection with rural rehabilitation after June 30, 1940. Under this limitation 459 corrugated-iron houses at an average cost of \$650 were built.

Agreements were made with the insular government whereby it would provide funds and the Department of Education would operate 16 community centers, the University of Puerto Rico would operate 10 canning centers, and the Insular Department of Health would operate 17 medical dispensaries which the PRRA had formerly operated. Further to preserve the benefits to the island of previous Federal expenditures, the PRRA has made lease agreements with the Insular Tobacco Institute and Forestry Service for continuation and expansion of tobacco and reforestation experiments, and with the agricultural experiment station of the University of Puerto Rico for hog breeding and poultry raising. All of the PRRA's breeding animals (about 710 swine, 3,500 chickens, and 115 goats) have been disposed of; oxen and other work animals have been transferred to applicable projects pending sale. In the resettlement areas, waterworks were transferred to municipalities within which they are located, under agreements obligating the municipalities to continue operation and maintenance.

Forestry

Reforestation work was continued in an area of approximately 21,000 acres, of which 1,700 were acquired during the fiscal year under commitments previously made. These lands were surveyed, marked, and partly fenced. Building of roads and trails was continued with consequent improvement of standing timber. Technical supervision was supplied by the Forestry Service of Puerto Rico, in cooperation with the Soil Conservation staff. One of the most valuable features of the work has been the continued program of making small parcels of from 6 to 20 acres of land within the forest areas available to homesteaders for the growing of food crops. Some 673 homesteaders have been so established on about 5,000 acres.

Soil Conservation

Emphasis was laid on the development of a self-sustaining type of farming, with a consequent increase in the production of foodstuffs. Cooperative effort in erosion control and crop adaptability practices was extended to the Agricultural Extension Service, the Housing Authorities at Fajardo, Ponce, and San Juan, the various vocational

agricultural schools, and other governmental agencies, including the Army in its areas of Bayamon, Vega Baja, and Aguadilla. Approximately 4,700 acres of land were protected by the building of terraces, barriers, ditches, diversion outlets, and gully control.

Cattle Tick Eradication

Systematic work in cattle-tick eradication was finished in the eastern zone the latter part of January 1941. It was found necessary to build 379 vats in that section, bringing the total number of dipping vats for the entire island to 1,161. In the fiscal year 203,205 cattle, 26,557 horses and mules, and 48,308 goats and sheep were systematically dipped. During the entire cattle-tick program of the previous years the PRRA has provided inspection of 434,190 cattle, 377,793 horses and mules, and 76,452 goats and sheep. Of these, 685,000 head were found to be infested with fever tick before dipping. The importance of the program in providing the island with a nucleus of a healthy supply of meat and milk is therefore apparent.

Housing Management

This office of the PRRA is charged with the management and upkeep of five urban housing projects comprising 1,051 family units, 2,570 homesteads in 7 rural resettlement areas, 3,133 rural homesteads scattered throughout the island, and 4,748 small parcels of land without houses which are leased to laborers for cultivation purposes. Occupancy as of June 30, 1941, was 100 percent in the urban projects, 95.56 in the 7 rural resettlement areas, and 91.79 percent in the scattered units.

Rental collections in round figures total \$236,540, with obligations for repairs and maintenance of \$136,500, leaving a gross return of approximately \$100,000. Of this \$40,000 is set aside as a reserve for future replacement, leaving a net return of approximately \$60,000 for the year.

Engineering and Construction

Mention has already been made of the 1,020 resettlers' houses built in the rural districts. Repairs were made on roads and bridges on Federal property at Las Charcas, Guayama, Castaner, and Adjuntas, and trails were completed leading to 26 houses of resettlers in the island of Vieques. The new laboratory building and library for the School of Tropical Medicine (total cost \$810,060) was brought to final completion. Improvements in the hydroelectric plant of the Isabela Irrigation Service were continued. Surveys were made as required on previous commitments for the acquisition of 616 parcels of land aggregating 1,651 acres.

Loans to Needy Farmers

Three years ago, as an important step in efforts to rehabilitate the island's agriculture, the PRRA initiated a program of making small loans to needy farmers who evidenced interest in raising food crops and livestock. Because of limited funds available, only 740 such loans aggregating \$147,470 were made during the fiscal year 1941, as compared with 1,596 such loans aggregating more than \$478,000 made the previous year.

Cooperatives

Organization, guidance, and financing of cooperatives was continued during the fiscal year. In one of the three vegetable marketing cooperatives previously financed by the PRRA, grower members sustained losses from plant diseases, and operations were suspended; however, the cooperative itself is in sound financial condition, and will experience no difficulty in repaying in full the loan made by the PRRA.

Two more small vegetable marketing cooperatives were organized, with operating loans from the PRRA aggregating \$9,000. Excessive rains impaired profits, but membership and plantings for the fiscal year 1942 indicate a substantial increase.

In the present season gross receipts of these four cooperatives marketing tomatoes, cucumbers and peppers were \$141,517.61, principally from exports to the New York market. Most of the 411 grower members enjoyed net profits equal to cost of production, and profits of many were double the amount of their investments.

The Vanilla Cooperative, which as reported last year marketed only 140 pounds, shipped 683 pounds of cured vanilla beans this year at \$6.65 per pound f. o. b. Puerto Rico and it will probably market at least 1,000 pounds during the fiscal year 1942. The 70 members of the cooperative have 465 acres of land planted in vanilla vines.

The Cotton Growers' Marketing Cooperative has members in both the northern and southern parts of the island, producing sea island cotton for export. The crop of the northern area, estimated at 2,000 bales of 500 pounds each, had not been harvested at the end of the fiscal year. On the southern coast, out of 437 bales produced, 141 bales were sold for about \$29,000. A loan of \$30,000 was made by the PRRA to enable the cooperative to advance to members 50 percent of the value of the cotton delivered at the gin.

The Sociedad Agrícola de Puerto Rico organized in 1939 with PRRA financing, principally to purchase farm supplies for members, now has a membership of 934. During the year it bought fertilizer aggregating \$134,874 and feed and miscellaneous supplies totaling

\$144,167. The original PRRA loan of \$200,000 is in current shape and has been reduced to \$155,000.

The Puerto Rico Artercraft Cooperative was originally financed with PRRA funds available only for the assistance of persons in the rural districts. This limitation made it difficult for the cooperative to procure a sufficient volume of handcraft articles for sale to the tourist trade. Accordingly, a loan was obtained from the Puerto Rico Self-Help Corporation (an insular agency) to repay the PRRA loan of \$12,500. Membership of the cooperative now consists of 149 persons in both rural and urban areas and it received \$24,733 from sales during the present fiscal year.

Operations of the Los Canos Sugar Mill Cooperative during the year 1940-41 produced 156,973 bags of sugar of 255 pounds each, or a little less than 20,000 tons of sugar out of 166,720 tons of sugarcane. Five thousand bags sold in the local market at \$3 per quintal, and at the time of the writing of this report, 101,766 bags had been shipped to New York at an average price of \$3.246, as against the average New York price for the grinding season of \$3.1916. The average sugar yield of the factory increased to 11.99 as against the 1940 figure of 11.06 percent. Los Canos also produced and sold 810,786 gallons of molasses at an average price of 4 cents to the Lafayette mill, and about 100,000 gallons at 0.046 to individual colonos of the Los Canos area.

The Lafayette Sugar Mill Cooperative ground 261,107 tons of cane—an average of 105.38 tons per hour—producing 251,818 bags of sugar of 250 pounds each, with an average sugar yield from cane ground of 12.118 as against 11.867 percent reported last year. It also produced 1,500,000 gallons of molasses, which together with 1,800,000 gallons purchased from other centrals, were used in the mill's butyl alcohol plant. The butyl alcohol plant at Lafayette came into commercial production during the year and is operating successfully. Additional distilling equipment now being installed will increase the output of this plant by 50 percent and will provide a further outlet for molasses, now a byproduct of the sugar industry.

During the year, sales have been completed to 73 individual colonos, of the 4,690 cuerdas of land which were reconveyed to the Government by the 12 Lafayette land cooperatives now in liquidation. These new land owners have been added to the membership of the Lafayette Mill Cooperative. Consummation of these sales safeguarded the Government's investment in the loans previously made to the 12 agricultural cooperatives, and followed the fundamental objective of the Lafayette project in providing a more equitable distribution of lands and better conditions of employment and living for laborers in the Lafayette area.

During the year loans totaling \$300,000 were made to Los Canos

and Lafayette for further improvements and complete electrification of these mills, in order to increase efficiency and to reduce production costs.

The Future

At this time only about \$1,350,000 has been provided for the financing of PRRA activities for the fiscal year 1942—\$1,253,553 having been allocated for approved projects from the revolving fund created by the act of February 11, 1936, and about \$100,000 being carried over from unobligated balances remaining in the appropriation made to the PRRA by the Emergency Relief Appropriation Act, for the fiscal year 1941. No additional appropriation was made by the Congress, and the limited amount available must be used principally to protect investments of the Government produced by previous PRRA programs, and to conserve social and economic progress that might be completely lost if the program were terminated without substitution of some other agency qualified to continue the work.

In previous years, particularly before the Work Projects Administration operated directly in the island, and before large expenditures were made for the defense activities, the PRRA was the only Federal agency equipped to alleviate the serious unemployment situation. On that basis it can no longer make claim for large appropriations.

But much remains to be done if the natural and human resources of the island are to be adequately developed; such development must depend largely upon progressive leadership, and the provision of capital for full utilization of all of the island's resources. In both respects the PRRA has made contributions not susceptible of measurement in terms of dollars and cents. Conditions that motivated the establishment of the PRRA do not appear in as bold outline as they did 6 years ago, but the problem still remains—the problem of a defense and ever-increasing population which is attempting to wrest a livelihood, mainly by agriculture, from exceedingly limited resources.

Division of Investigations

DALE B. WHITESIDE, Director

THE DIVISION OF INVESTIGATIONS during the fiscal year 1941 gave preferred attention to investigations for the various bureaus and offices of the Department whose activities contributed to the facilitation of national defense and the continuation of the program for conservation of the resources of the public domain.

Preceding the establishment of the reserve on the Mojave Desert in California for use as an antiaircraft practice range by the War Department, a general examination of the land was made by special agents of this Division. Boundaries suggested by the special agents to eliminate many controversial situations were adopted by the War Department. Following the creation of this reserve the Division took steps to clear title to the area, which required the checking of mining claim records and the examination of approximately 900,000 acres of land. Reports have been submitted recommending cancellation of 2,785 invalid mining claims in this area and proceedings to cancel the claims are now in progress. Completion of the work will necessitate a search for approximately 6,000 individual claimants so that they may be served with notice of the proceedings. The Division is also working in close cooperation with the War Department in the handling of numerous problems of a general nature which arise from day to day in connection with the utilization of the large area of land included in this reserve.

Representatives of the Division have also participated in a large number of hearings affecting mining claims in conflict with the Muroc Bombing Reserve, located in the State of California. During the fiscal year decisions were rendered canceling 61 invalid claims. A consolidated case involving 158 claims affecting the clay deposits on Muroc Dry Lake is now pending before the Department. In connection with this particular case the Division has cooperated with the War Department and the Department of Justice in securing restraining orders against the mineral claimants to prevent them from interfering with the activities of the War Department during the pendency

of the proceedings. As a result the reserve may be utilized for carrying on airplane bombing practice prior to final action on the claims.

The Division continued to cooperate with the Bureau of Reclamation in the handling of condemnation suits involving mineral questions and in the cancelation of invalid mining claims on lands needed for construction purposes, particularly on the Grand Coulee project in the State of Washington and the Central Valley project in the State of California. This work has included a large number of mineral investigations and land appraisals, and many involved mineral cases are still under investigation. This work will continue until the projects are completed. In each case where mineral value is claimed a careful investigation is made before the lands are purchased, and it is believed that as a result thereof a considerable saving of money will be realized by the Government.

Among the outstanding contributions of this Division to the national defense through conservation has been the part it has played in the program to protect and promote proper use of grazing lands on the public domain, under the provisions of section 15 of the Taylor Grazing Act. During the fiscal year reports were submitted on 2,905 applications for grazing leases. While this work has been particularly effective in helping to conserve the public grazing lands, it has also resulted in the adjustment of disputes between rival stockmen who in the past have competed for the use of these lands to the detriment of the forage growth thereon. The Division has been able to settle practically all controversies with a minimum of friction between stockmen filing conflicting applications. Wherever possible these disputes have been settled by agreement, and this has been accomplished in a large proportion of the cases. Where such agreements were not arrived at, the special agents weighed carefully the respective rights of the parties and used their best judgment in submitting recommendations for distribution of the use of the open range. Satisfaction of the stockmen with the divisions so made is evidenced by the comparatively small number of appeals which have been filed.

It was revealed during the fiscal year that in some cases unnecessary amounts of land had been included within stock driveways. For example, one driveway in Arizona was as much as 6 miles wide in places. As a result of petitions filed by individuals in the livestock business it was possible to bring about a reduction of the area included in the driveway. Meetings were held by the stockmen, at which the problem was freely and frankly discussed, and the stockmen agreed to the elimination of a considerable portion of the driveway. The land so eliminated now becomes available for lease under section 15 of the Taylor Grazing Act.

Following the decision of the United States Supreme Court in the

case of the *Virginia-Colorado Development Company vs. The Secretary of the Interior*, rendered during the year 1934, all cases relating to oil shale claims which did not involve the question of discovery were closed. However, there were listed for investigation during the year 297 oil shale placer mining claims against which adverse proceedings have been pending for some time, involving a charge of nondiscovery, and the General Land Office has requested the cooperation of this Division in ascertaining the addresses of persons holding record interest in oil shale cases in which adverse proceedings charging nondiscovery have been directed. A considerable number of persons have been located, and this work will be continued during the fiscal year 1942.

In a number of instances during the fiscal year, the Grazing Service called upon this Division for the investigation of alleged grazing trespasses, chiefly because the individuals to whom licenses were issued did not stay within the limits allowed. Court action was necessary in some cases to force the individuals to comply with the terms of their licenses and to pay the Government damages estimated in accordance with the rules of the Grazing Service.

The Grazing Service also requested an investigation relating to the poisoning of livestock on lands in northern Nevada, alleged to have been the result of arsenic fumes emanating from an ore reduction plant erected by a mining company. The investigation developed that livestock was being poisoned by these fumes, and the company is arranging to remedy the condition by the installation of a method to control the poisonous fumes. Another investigation will be made after the results of the plan have become apparent.

Although there have been numerous withdrawals of lands from homestead entry in recent years, a substantial number of cases involving the rights of entrymen are still being handled. Such investigations, for the most part, relate to entries or settlements made prior to the withdrawals and many of the claimants have been granted extensions of one type or another under the law and regulations of the Department. During the fiscal year 625 homestead cases were referred to the Division for investigation and reports were submitted on 1,268. While a decrease is in evidence, withdrawals from entry have by no means caused a cessation of activity along this line.

It has been the custom in some sections of the country for livestock operators to look upon the open range as an extension of their pastures. A considerable number of stockmen have gone so far as to fence public lands to keep others from trespassing upon what they consider their private property. Many, apparently, have done so without realizing they they were acting in violation of the law. Through cooperation with the General Land Office and the Grazing Service this Division has contributed to the solution of the problem by making investigations and submitting reports containing recommendations relating to the

removal of such fences. In many instances it has been possible through adjustments and exchanges to permit fences to remain, but in others, where the occupants could show no legal right to the use of the lands, steps have been taken looking to the removal of the fences.

The enactment of Public Law 151, Seventy-seventh Congress, approved July 3, 1941, has paved the way for an equitable settlement of the important case involving a number of oil placer mining claims located in the Lance Creek field in Niobrara County, Wyo. This legislation climaxed the efforts of this Division initiated in 1937 to ascertain the validity of the original placer locations and to establish the relative rights of the United States and the present operators. As a result the above-mentioned legislation was introduced in the Congress, which in effect provided that the major oil companies which were operating in the Lance Creek field on the assumption that the original locations were valid, could now apply for a lease from the United States covering their present operations. As one of the conditions to the issuance of such leases, the applicants must pay to the United States a royalty on all past production extending in certain instances over a period of 20 years. Action on outlying oil placer claims located in this field is being carried forward to completion.

The Division has at the request of the National Park Service conducted investigations of mining claims and appraisals of lands to be purchased for inclusion in the various national parks and monuments. The largest undertaking of this nature has been the clearing of title to lands within the Joshua Tree National Monument in California.

During the spring of 1941, an investigation was made relating to the selection of certain lands for an airport near Jackson, Wyo. The area included some lands under the jurisdiction of the National Park Service, and the investigation resulted in a selection of land which was satisfactory to proponents of the airport and also acceptable to that Service in connection with its development plans.

In the latter part of the fiscal year, a case involving alleged illegal mining locations in the Great Sand Dunes National Monument, Colorado, which had previously been investigated by the Division of Investigations, proceeded to hearing. At the hearing the mineral claimant indicated that he would abandon his locations and remove the buildings from the lands involved, which are needed by the National Park Service for recreational purposes.

During the year, this Division has continued to cooperate with the Forest Service under the interdepartmental agreement of 1915, with relation to the examination of mining claims and mineral entries on lands within national forests. A number of investigations have been made, and the services of this Division have been utilized in connection with hearings which have resulted in these cases.

Removal of gold from lands reserved for the use of the War Department in connection with the construction of the Ruck-A-Chucky Debris Dam on the American River in California, furnished the basis for an interesting and unusual investigation. It was disclosed that employees of the contracting company accidentally uncovered a deposit of gold-bearing gravel so rich that within a short time they recovered \$27,645 worth of gold. A considerable part of this gold is now being held by the United States Mint at San Francisco, and the case is in the hands of the Department of Justice. Suit will be instituted to recover the value of all gold removed from the tract of withdrawn land.

The following violations were investigated, on which reports were submitted during the fiscal year ended June 30, 1941, for criminal prosecution:

Embezzlement.....	8
Soliciting political contributions.....	1
Submitting false claims against the United States.....	2
Theft of Government property.....	3
Timber trespasses.....	3
Grazing trespasses.....	6
Oil and gas frauds.....	1
Unlawful occupancy of public lands.....	1
Perjury.....	1

Nine persons were indicted during the fiscal year and 14 defendants, of whom 9 were indicted prior to July 1, 1940, either entered pleas of guilty or were convicted. Seven cases, five of which were submitted prior to July 1, 1940, were dismissed and 19 of the cases submitted were pending at the close of the fiscal year.

During the fiscal year special agents of this Division made an audit at the request of the Department of Justice for the purpose of determining the amount and value of lead and zinc concentrates produced by lessees and sublessees from the lands of restricted Indians in the State of Oklahoma during the period from June 1, 1916, to December 31, 1940.

Assistance rendered the General Land Office has included cooperation with the Oregon and California Revested Lands Administration in the investigation of cases of incendiary forest fires, unlawful occupancy of reserved lands, the cancelation of invalid mining claims filed for the purpose of maintaining control of portions of the reserved lands, and in the investigation of timber trespasses. In addition to the timber trespass cases on Oregon and California lands, this same work has been carried on in connection with all of the public lands under the control of the General Land Office, and along with it the Division has supervised the issuance of free-use timber permits and arranged for the sale of damaged timber.

In the investigation of the claim of the State of Wisconsin involving an island in the Mississippi River near La Crosse, Wis., under the Swap Land Act of September 28, 1850, it was necessary to determine the swamp character of the land as of 1850. This determination entailed interviews with the oldest residents in the vicinity of the island, a study of the stream gauges maintained by the War Department as to the flow of the Mississippi River over a period of years, and a survey of the type of trees and forage crops on the land.

Summary

The Division of Investigations, on June 30, 1941, consisted of 133 employees, of whom 21 were on duty in the Central Office, Washington, D. C., and 112 in the 5 regional offices located at San Francisco, Calif., Billings, Mont.; Salt Lake City, Utah; Albuquerque, N. Mex.; and Washington, D. C.

Investigations made during the fiscal year were of a decidedly diversified nature, and touched upon the activities of most bureaus and offices of the Department, as well as those of other departments and agencies of the Government. During the year there were received 10,082 cases for investigation and reports were submitted on 19,043, the largest number of cases closed in any one fiscal year since the formation of the Division. On June 30, 1941, there were pending investigation 5,271 cases. Following is a résumé of the work accomplished:

Type of case	Pending July 1, 1940	Received	Closed	Pending June 30, 1941
Appraisals (including mining claims).....	9,592	3,088	12,100	580
Application to cut tumber.....	0	2	2	0
Application to purchase.....	2	1	2	1
Court cases, miscellaneous, civil.....	13	15	24	4
Court cases, criminal.....	24	28	37	15
Desert entries.....	103	889	138	854
Grazing applications.....	28	0	0	28
Grazing leases.....	1,393	2,763	2,904	1,252
Grazing permits.....	0	1	1	0
Homesteads.....	1,111	625	1,268	468
Irrigation projects.....	5	2	5	2
Isolated tracts.....	261	214	347	128
Land classification.....	0	2	0	2
Land exchanges.....	127	212	216	123
Leases, Alaska.....	3	70	34	39
Mineral entries.....	116	113	100	129
Miscellaneous.....	68	205	219	54
Official conduct.....	3	2	1	0
Oil and gas leases.....	1	0	1	0
Oil shale.....	67	297	1	363
Oil placer claims.....	52	250	182	120
Permits.....	8	14	11	11
Personnel.....	25	154	160	19
Qualification of abstractor.....	0	1	0	1
Rights-of-way.....	5	3	5	3
Scrip applications.....	2	1	3	0
Selections.....	67	64	93	38
Stock driveways.....	23	24	34	13
Swamplands.....	1	2	2	1
Timber cases.....	408	258	314	352
Timber and stone.....	0	4	4	0
Trespass, coal.....	208	115	203	120
Trespass, timber.....	345	332	317	360

Type of cases	Pending July 1, 1940	Received	Closed	Pending June 30, 1941
Trespass, grazing.....	115	189	209	95
Trespass, gravel.....	0	2	0	2
Trespass, signboard.....	0	73	0	73
Unlawful enclosures.....	32	16	36	12
Unlawful occupancy.....	0	5	0	5
Water reserves.....	3	0	3	0
Indian allotments.....	0	45	45	0
Indian audits.....	21	1	22	0
Total.....	14, 232	10, 082	19, 043	5, 271

Expenditures

During the fiscal year 1941 the Division of Investigations operated under an appropriation of \$470,000, which was expended as follows:

Salaries:

Departmental.....	\$40, 350
Field.....	300, 836

341, 186

Office supplies and equipment.....	2, 959
Travel expense and per diem.....	84, 302
Purchase, maintenance, and operation of automobiles.....	32, 800
Communication expenses.....	2, 284
Transportation of things.....	430
Rent of office space.....	2, 053
Rent of equipment.....	33
Repairs to equipment.....	170
Stenographic services.....	6
Miscellaneous current expenses.....	2, 238
Unobligated surplus.....	1, 539

Total appropriation..... 470, 000

Division of Personnel Supervision and Management

MRS. J. ATWOOD MAULDING, Director

IN ADDITION to its normal duties during the past fiscal year the Division of Personnel Supervision and Management geared itself to the new and urgent needs created by national defense as it has affected the functions of the Department, and rendered greater assistance to the supervisors and administrators having these new tasks to perform. The majority of the bureaus and offices of the Department, and specific activities of others, have been designated as defense activities. While the immediate problems of personnel have been given the right-of-way, long-range plans and programs have not been overlooked.

Considerable emphasis has been placed on recruitment, with particular reference to the specialized needs of the bureaus and offices engaged on defense work. The Division has been in close contact with the Civil Service Commission, and the Chief of the Recruitment and Selection Unit spent many hours in conference with representatives of the bureaus and the Commission discussing and preparing announcements for examinations and obtaining through selective certification the type of persons necessary to perform the duties in highly specialized positions. Several examinations and particular options in other examinations were held primarily for this Department, and the Commission was assisted in preparation of test questions and, in some cases, in the rating of the examinations. The Department's promotion-from-within policy has not been sacrificed, as the employees of the Department receive first consideration in the filling of all vacancies.

Military Furloughs

During the year 543 employees of the Department have been placed on military furlough which has resulted in a definite personnel recruitment problem. Although many employees have been promoted for the duration of a military furlough, there has been a lack of qualified personnel either within or outside the Department to fill certain

vacancies, particularly in the engineering field. It is the policy of the Department not to request deferment for its officers and employees on the basis of their activity being "necessary to the maintenance of the national health, safety, or interest" except where the work which the individual is performing is believed to be more useful to the national-defense program than the proposed training and service, or where temporary deferment is necessary to finish a particularly important job. The mere fact that an employee is working in connection with an activity related to national defense has not of itself justified a request for deferment; there has been considered also whether the individual might not reasonably be replaced.

By application of the Ramspeck Act, non-civil-service employments in the Department, with the exception of those normally falling under schedule A of the civil-service rules, are now practically eliminated. However, during the past year it was necessary for the Division to operate as a miniature civil-service commission in receiving and rating applications, and certifying eligibles to fill vacancies in the non-civil-service group, mainly in the work of the Civilian Conservation Corps. In this connection 9,359 applications were received, personally examined and rated, and 1,975 certificates of eligibles containing 5,609 names were issued from which selections were made.

Often the Division is able to fill civil-service vacancies from applications of persons who have applied for transfer from other agencies or for reinstatement. There were 2,075 applications received for civil-service positions which were personally examined and rated and 537 certificates containing 1,024 names were issued from which selections were made. The majority of these certificates were for lower grade positions. Over 2,000 applicants for positions were personally interviewed during the year. In accordance with the Department's policy of assisting in orienting new employees and making the trial period a part of the entrance examination, 182 probationary employees in the departmental service were also personally interviewed after a month of service and 2,392 reports on the services of all probationary employees throughout the Department were personally reviewed.

Supervisors' Forums

One project of the training program started during the past year worthy of special mention is the Supervisors' Forums. The heads of the various divisions in the Office of the Secretary formed a master session for the purpose of setting the style and cutting a pattern of programs of training in the technique of supervision. After two preliminary meetings, a formal series of semimonthly conferences was

instituted and before its conclusion another series was begun for supervisors at a lower level. It is planned to carry this work to the bureaus and offices of the Department by organizing another supervisors' forum which will have for its purpose the training of trainers, who will in turn organize and conduct similar programs within their own bureau.

Another form of employee training which was satisfactorily begun during the year was that of conferences on specialized procedures. A series of six weekly meetings was attended by 22 representatives of the bureaus and offices and had for its purpose the spreading of a thorough and uniform understanding of leave regulations and practices. It is intended to follow this series with others devoted to other specialized procedures.

At the beginning of the year the Advisory Committee of the National Council of Defense asked this Department to detail its training officer to the council to assist in a Nation-wide survey of personnel needs and training facilities in the defense agencies. The Department was glad to cooperate with the council and has continued to keep the survey up to date as new agencies are added to the list.

The past year has afforded an opportunity to review the result of the extension of the same efficiency rating system to the field that for so many years has been applicable in the departmental service. Designed to assure fairness and equity to employees of the Federal service in evaluating their services, the system is also calculated to aid administrative officers in the selection of personnel for advancement and in general business management. A sympathetic willingness and endeavor to understand and apply the system have served both purposes.

Salary increases in the Department have been restricted to some extent by the limitations in the appropriation acts for the past fiscal year and the formula laid down by the Bureau of the Budget and the House Appropriations Committee. A more uniform policy for making salary increases is greatly needed and the recent passage of H. R. 1073 is a step forward toward this goal.

Because of the interest on the part of officers and employees in what is going on in the field of personnel administration, in April the Division began the publication of a bimonthly *Personnel Bulletin* dedicated to the improvement of personnel relationships throughout the Department. This bulletin presents information on timely subjects and the Division welcomes suggestions and articles from the employees.

The stenographic training center has continued throughout the year with timed tests indicating its value as an introductory method to the Department. It has been ascertained that stenographers who have attended the center have increased their transcription speed from an average of 27 words a minute on the first day to 41 on the twelfth day—

a speed-up of 27 words per minute, which indicates a 50 percent increase in productive capacity.

During the year the Chief of the Employee Relations Unit reviewed 1,075 cases including grievances, charges, discipline, and other types involving employee relations. By far the greater number of these were of more or less minor importance, involving misstatements regarding date of birth, and the like. The safety and health programs within the Department are being reviewed, and on March 7, 1941, the Secretary appointed a committee on health and safety, of which the Director of Personnel is a member. Publications on health and safety phases, issued by the Public Health Service and other organizations have been distributed to the bureaus and offices.

As a result of the Reorganization Plan No. 3 it was necessary to consolidate the records of the Bureau of Fisheries and the Bureau of Biological Survey. Later in the year, under Reorganization Plan No. 4, more than 400 employees of the Soil Conservation Service were transferred to the Department and all their personnel records were taken over from the Department of Agriculture. During the year the appointments unit journalized 18,741 appointments, status changes and organization changes requiring signature. There was a total of 23,372 personnel actions. In addition, 22,291 other written actions were prepared including requests for transfer and reinstatement requests for eligibles, reports on certificates, etc. During the year all regular reports were furnished to the Civil Service Commission, Office of the Director of the Civilian Conservation Corps and Bureau of Labor Statistics. Semiannual reports of employment by sex and classification, and a report on positions in the Department covered by the Ramspeck Act were also furnished the Commission. The Personnel Files Section made considerable progress in transferring old material not completely indexed into the present filing system resulting in increased efficiency and better service in locating correspondence.

Pay roll and leave work was increased considerably by requirements of certification as to citizenship, leave questions arising in connection with military service and additional reports required by the Treasury Department and the Civil Service Commission. Approximately 66 regular and 43 supplemental pay rolls were prepared monthly with 275 accompanying schedules or statements per month.

As required by the Civil Service Commission, for the Board of Actuaries, a 5-year survey was made of retirement credits which involved a detailed review of each record. The retirement fund of Interior employees at the close of the fiscal year 1940 amounted to \$7,079,435.64 exclusive of the Alaska Railroad Retirement fund which amounted to \$290,872.63. During the year 87 employees were retired on account of age and 80 due to disability. As of May 1, 1941, there were 18,882 employees in the Department subject to the retirement

act and more than 16,000 records are maintained in this office, an increase of 2,000 over last year.

At the close of June 30, 1941, there were 48,941 employees in the Department of the Interior, 4,567 in Washington and 44,374 in the field.

Office of the Solicitor

NATHAN R. MARGOLD, Solicitor

THE STEADY INCREASE in both the number and the difficulty of the legal problems presented for consideration which has been remarked upon in prior reports continued unabated throughout the fiscal year. Many statutory and administrative conservation programs have been originated and undertaken during recent years in order to bring about the fullest beneficial utilization of the land, water, mineral, wildlife, and other natural resources of the Nation for all of the many varied purposes to which they are capable of being put if properly managed. Progress in the formulation and execution of these programs has entailed a constant growth in the complexity and intricacy of the legal problems which must be solved in furthering the prudent development and multiple application of the national estate, as well as a corresponding growth in the sheer volume of the work load. Over the course of the fiscal year just closed the upward trends in the quantity and gravity of legal tasks were further intensified by reason of the added duties entailed in working out arrangements which would enable the enormous national defense values of the resources husbanded and protected under the conservation programs to be drawn upon for the purpose of supplying vital national defense needs quickly and effectively.

Immediate Office of the Solicitor.—The volume of legal work moving through the immediate office of the Solicitor is indicated by the following table, which shows the number of tangible items disposed of during the fiscal year:

Requests for formal Solicitor's opinions.....	543
Legal memoranda and correspondence.....	2, 265
Appeals from adjudications of the General Land Office and Grazing Service	471
Motions for rehearing and petitions for the exercise of super- visory authority.....	75
Board of Equitable Adjudication cases.....	665
Legislative matters.....	2, 005
Construction and supply contracts.....	741

General Land Office matters, except mineral and grazing leases	2, 989
Oil and gas leases	2, 521
Other mineral leases	157
Grazing leases	75
Geological Survey matters	264
Bureau of Mines matters	141
Petroleum Conservation Division matters	37
War Minerals Relief cases	123
Grazing Service matters	310
Office of Indian Affairs matters	8, 923
Bureau of Reclamation matters	1, 331
National Park Service matters	1, 102
Fish and Wildlife Service matters	661
Division of Territories and Island Possessions matters	311
Division of Investigations matters	102
Miscellaneous items	112
Total	25, 924

Over the course of the fiscal year the Solicitor and the members of the legal staff personally defended 26 suits brought against the Secretary of the Interior or other public officers on account of acts performed by them in an official capacity. Eighteen of these suits were concluded during the year, leaving eight pending at its close. Favorable judgments were obtained in all of the 18 cases completed.

Major litigation of deep concern in the effective development of hydroelectric energy on reclamation projects was brought to a successful termination through the vigorous defense of *Burley Irrigation District v. Ickes*, 116 F. (2d) 529, in the Court of Appeals for the District of Columbia and the Supreme Court of the United States. The basic legal principle involved was the authority of the Department of the Interior to control the operation of power plants and other facilities on reclamation projects in such a way as to bring about the maximum utilization of the available water supply for the combined purposes of power production and irrigation of project lands. The Court of Appeals sustained the action taken by the Department in every respect, and the Supreme Court denied a petition for certiorari to review this decision. The immediate effect of the recognition thus accorded the authority of the Department will be to save the United States \$50,000 annually in connection with the sale of power produced on the Minidoka project. Of even larger significance are the possibilities opened for more effective multiple use of the limited water resources of the arid and semi-arid States.

An accomplishment of substantial moment to the effective protection of the mineral resources of the public domain was the successful defense in the Supreme Court of the United States of a petition for certiorari to review the decision of the Court of Appeals for the District of Columbia in *Dunn v. Ickes*, 115 F. (2d) 36. This holding

sustained the right of the Department to determine the circumstances in which administrative proceedings for the granting of an oil and gas lease under the Mineral Leasing Act of February 25, 1920, might appropriately be instituted.

The freedom of action of public officers in administering the public business entrusted to their care was materially advanced by the action of the Supreme Court in denying a petition for certiorari to review the decision of the Court of Appeals in the libel case of *Glass v. Ickes*, 117 F. (2d) 273. The decision in question held that alleged defamatory statements made by the Secretary of the Interior in the course of performing his official duties were privileged communications which could not be made the subject of an action for damages against the utterer.

The preparation of formal and informal opinions upon points of law submitted to the Solicitor for official rulings necessitated a large amount of attention throughout the fiscal year. The number of formal opinions requested increased from 380 in 1940 to 481 in 1941. The number of formal opinions written increased from 367 in 1940 to 543 in 1941. Sizeable increase in the volume of informal memoranda opinions which had to be prepared also took place.

The interpretation of the phrase "Indians not taxed" as used in the Constitution of the United States and the fourteenth amendment formed the subject of one of the most important opinions prepared. The objective of this study was to determine the extent to which Indians should be included in the enumeration of the population of the several States on the basis of which representation in the House of Representatives is apportioned. The conclusion reached was that the Federal legislation dealing with the Indian tribes, and in particular the legislation subjecting tribal Indians to Federal taxation, had placed all Indians outside the category of "Indians not taxed," and thereby entitled them to representation in the House of Representatives. This view of the matter was adopted by the President in preparing the new apportionment of memberships in the House of Representatives pursuant to the census of 1940, under which all Indians are counted in determining the quotas of the several States.

A public-land matter which required extensive consideration during the year was the power of the President to incorporate in proclamations setting aside areas for Federal use provisions withdrawing those areas from all forms of appropriation under the public-land laws, including appropriation under the laws relating to mining claims for metalliferous minerals. Doubts with respect to the President's power in this particular arose out of a provision in the Withdrawal Act of June 25, 1910, as amended, declaring that all lands reserved pursuant to the authority conferred by that act should be open to exploration, discovery, occupation, and purchase in accordance with the general

mining laws applicable to metalliferous minerals. Detailed study of the legislative history of the withdrawal act by the legal staff disclosed material indications, however, that its provisions were intended to cover only temporary withdrawals for classification and certain other purposes, and were not designed to restrict the President's inherent power to make permanent withdrawals of public lands for use by Federal agencies in carrying out their acknowledged functions. After painstaking investigation of all relevant factors it was concluded that the President in making permanent reservations for public use might withdraw the lands involved from appropriation under the metalliferous mineral mining laws. This position was sustained by the Attorney General in an opinion dated June 4, 1941. The determination so arrived at is of great importance in connection with the very large tracts now being set aside for gunnery ranges and other military uses, since the establishment of mining claims on these lands would seriously impede their effective employment for national-defense purposes.

The prospects for long drawn-out administrative and judicial proceedings to determine the validity of a number of mining claims covering valuable oil and gas deposits in the Lance Creek field of Wyoming were substantially forestalled through the working out of an arrangement for the settlement of the controversy, under which the claimants will be entitled to receive leases for the lands involved subject to the payment of prescribed royalties and compliance with other equitable conditions. This arrangement has been embodied in legislation which was enacted shortly after the close of the fiscal year. The Government, it is estimated, will receive \$1,480,000 as a result of the settlement thus effected, in addition to saving the expense of proceedings to contest the validity of the claims.

Expansion and intensification of the various services performed for the benefit of the Indians under the direction of the Secretary of the Interior also resulted in many new calls for legal advice and assistance. Problems connected with the protection of Indian property from exploitation and encroachment, and with the betterment of Indian social and living conditions, received much attention from the legal staff throughout the year. Negotiations for the settlement of disputes with respect to the custody and investment of Indian trust funds aggregating several million dollars in amount were an individual item of importance.

Federal Indian law is based upon more than 4,000 statutes and treaties and more than 5,000 judicial decisions and administrative rulings. The ambitious project of compiling a Handbook of Federal Indian Law digesting and analyzing this vast mass of materials was brought to final fruition during the year. The handbook sets forth in orderly form all of the major principles of Federal Indian law,

discusses their history and application, and cites the authorities on which they rest. The supporting tables and index list all statutes, treaties, decisions, and rulings affecting each tribe, indicate the extent to which each statute or treaty has been subsequently amended or supplemented, list the decisions and rulings interpreting each statute or treaty, and contain a variety of other helpful data. The handbook was published shortly after the conclusion of the fiscal year.

Recent legislation enlarging the functions of the Bureau of Mines had a pronounced effect upon both the volume and the complexity of the legal services which staff members were called upon to perform for that agency during the year. The widespread activities of the Bureau of Mines in developing and perfecting processes and facilities for the recovery of strategic and critical minerals from ore deposits hitherto deemed unavailable were a source of many novel legal problems. The work done toward the solution of these problems materially contributed to the promotion of the national defense. Enactment of a Federal coal mine inspection law in the latter part of the year also expanded the range of matters requiring legal consideration to a very substantial degree.

More than 75 statutes directly bearing upon the work of the Department were enacted during the fiscal year. Some of the more important of these are listed below.

76th Congress, 3d Session

Public, No. 726: Relating to rentals in certain oil and gas leases issued under authority of the act of February 25, 1920, as amended, and for other purposes.

Public, No. 755: To encourage travel in the United States, and for other purposes.

Public, No. 756: Authorizing the Secretary of the Interior to promulgate and to put into effect charges for electrical energy generated at Boulder Dam, providing for the application of revenues from said project, authorizing the operation of the Boulder Power Plant by the United States directly or through agents, and for other purposes.

Public, No. 819: To permit the States to extend their sales, use, and income taxes to persons residing or carrying on business, or to transactions occurring, in Federal areas, and for other purposes.

Public, No. 861: To promote and strengthen the national defense by suspending enforcement of certain civil liabilities of certain persons serving in the Military and Naval Establishments, including the Coast Guard.

77th Congress, 1st Session

Public, No. 34: To extend the provisions of the Bituminous Coal Act of 1937 for a period of two years, and for other purposes.

Public, No. 49: Relating to certain inspections and investigations in coal mines for the purpose of obtaining information relating to health and safety conditions, accidents, and occupational diseases therein, and for other purposes.

Public, No. 75: Extending the application of section 6 of the act entitled "An act to expedite the strengthening of the national defense," approved July 2, 1940 (54 Stat. 714), to all territories, dependencies, and possessions of the United States, including the Philippine Islands, the Canal Zone, and the District of Columbia.

Public, No. 76: To appropriate the proceeds of sales or other dispositions of strategic and critical materials acquired under the act of June 7, 1939 (53 Stat. 811), in order to prevent depletion of the stocks of such materials available for national-defense purposes.

The Year's Activities

The systematic explorations for strategic and critical minerals conducted by the Bureau of Mines necessitated the performance of considerable title work directly related to the national-defense program. This work included the making of title searches of mining properties and the preparation of mineral exploration agreements. Over the course of the year the titles to 55 mining properties, comprising approximately 310 individual mining claims in the Western States and approximately 2,500 acres of mining lands in the Eastern States, were searched.

During the fiscal year 1941 the volume of legal matters presented to the Law Division of the General Land Office for consideration increased more than 20 percent, 44,987 items being disposed of in this period as compared with 36,944 items handled during the preceding fiscal year.

A substantial increase in the volume of public-land litigation and trespass work occurred during the year. Recommendations for the institution of suit were made to the Department of Justice in 32 cases, and the sum of \$47,347.52 was collected through suit. This was twice the number of court actions recommended and more than twice the sum collected during the preceding year. Administrative proceedings conducted under the supervision of the legal staff for the recovery of damages on account of trespasses injuring the public domain resulted in the collection of \$27,477.50, as compared with \$18,215 collected in the fiscal year 1940.

Geological Survey legal work related primarily to the supervision of mining operations conducted under public domain mineral leases, principally those covering deposits of oil and gas. It also included an increasing volume of questions incident to the activities of the Geological Survey in mapping the topography of the United States and its possessions, in exploring and inventorying the water and mineral resources of the public domain, and in extending information and assistance on geologic problems to other agencies of the Government.

The Law Division of the Office of Indian Affairs was called upon during the fiscal year to perform a variety of difficult and important

tasks in the highly specialized field of Indian law. Its primary function was that of advising the administrative officers of the Indian Service upon all legal matters incident to the performance of their duties.

The Washington and field offices of the Legal Division of the Bureau of Reclamation were called upon during the fiscal year to perform legal services materially greater than in prior years. Major facilities in process of erection on several of the larger reclamation projects, including the Grand Coulee Dam, reservoir, and power plant on the Columbia Basin project, and the Shasta Dam, reservoir, and power plant on the Central Valley project, necessitated the shouldering of heavy legal tasks in the land acquisition and construction contract field. Expansion and acceleration of work on these facilities for the purpose of developing supplies of hydroelectric energy vitally needed by defense industries led to corresponding speed-ups in legal activities. In addition, the multiple purpose features of many of the project facilities now coming into operation caused a decided increase in the difficulty and complexity of the problems presented for legal consideration.

The overcoming of all legal obstacles incident to the drawing up of the power contracts authorized by the Boulder Canyon Project Adjustment Act, enacted early in the year, was an accomplishment of prime importance to the national-defense industries, and other developments, located in the Los Angeles area. The nine contracts executed provide for the operation of the Boulder Dam power plant and for the sale of its entire output until May 31, 1987.

In order to allow the flooding of the Grand Coulee Reservoir at the earliest possible date, acquisition of the reservoir lands was expedited and pushed to completion during the year. The properties which have been taken over since the inception of the reservoir program were divided into more than 2,500 separate ownerships, of which about 98 percent have been acquired by purchase and about 2 percent by condemnation. Completion of this work well in advance of the date originally contemplated made possible the filling of urgent demands for additional power to be used in the production of aluminum and other materials greatly needed for the national defense.

Intensive consideration was also given to the protection of water and power facilities serving essential military and civilian needs against the dangers of sabotage and subversive activities and to the development of ways and means for combatting such dangers.

The Office of Chief Counsel of the National Park Service handled a very large volume of problems representing almost every field of law. The estimated number of matters passed upon was over 24,000 for the Washington office and 5,000 for the field offices.

The Office of Chief Counsel of the Fish and Wildlife Service was established in July 1940, in order to promote the coordination of legal

work in the fish and wildlife field and to provide an adequate basis for the final disposition at the bureau level of legal questions arising in this field. Widely varied legal tasks growing out of the administration of the Migratory Bird Treaty Act, the Migratory Bird Conservation Act, the Alaska Game Law, the laws governing the commercial fisheries of Alaska, and other enactments directed to the conservation of the game and food resources of the nation were attended to during the year. One task of outstanding importance was the working out of the legal problems incident to the formulation and promulgation of the annual revision of the Alaska fisheries regulations.

The Office of Chief Counsel of the Division of Territories and Island Possessions was established in September 1940. Promotion of the national defense was the immediate objective of many of the tasks performed during the year. Among the more important items of this character were Executive orders transferring jurisdiction over lands in various territories and possessions to the War or Navy Departments, questions pertaining to the validity of an appropriation for the Alaska National Guard made by the territorial legislature, questions pertaining to the collection and deposit of defense taxes in the Virgin Islands, legislation authorizing housing projects for families of defense workers in Alaska and Puerto Rico, legislation authorizing the organization of a home guard in the territories, questions pertaining to the admission into the Virgin Islands of nonimmigrant aliens needed for employment on defense projects, and development by the Rural Electrification Administration and the Virgin Islands Co. of a rural electrification project on the island of St. Croix which will furnish power to the Army air base being constructed on that island.

Substantial new increases in the tasks of the Legal Division of the Bonneville Power Administration occurred during the fiscal year. Many more power contracts were drafted and consummated than in the preceding year, numerous problems arose in connection with service under existing contracts, enlarged construction activities added materially to the work load, progress in the development of the transmission system required the solution of many problems, and weighty duties stemmed from the impact of power operations upon the national defense program.

In the course of the year 46 contracts dealing with the sale of electric energy were executed, including contracts for the sale of 220,505 kilowatts of energy produced at the Bonneville and Grand Coulee dams. A number of these contracts involved the sale of electric energy for use by critical national defense industries, especially the aluminum and carbide industries. Others involved the sale of energy for use at military, naval, and coast guard stations. The formulation

of an Executive order providing for the coordination of the electric facilities of the Grand Coulee Dam project and the Bonneville project and for the unified disposition of the power generated thereat was another major accomplishment.

Division of Information

MICHAEL W. STRAUS, Director

POPULAR RECOGNITION of the part played by conservation in national defense brought to the Division of Information increased opportunities for public service during the past fiscal year. Carrying forward the fundamental policy of the Department that wider understanding of its activities and objectives, rather than methods of arbitrary policing and harsh enforcement, constitutes the best way to obtain the cooperation of the citizens in a democracy, the Division made available to the public authentic information concerning the operations of the various departmental agencies. This service was rendered through use of the printed word, the radio, and photography, and the cooperation of such established Nation-wide information media as private publications, radio stations, newspapers, and periodicals of wide circulation.

Early in the year, the duties of the Division were expanded to include the dissemination of official information relating to the Fish and Wildlife Service upon the consolidation of the Bureau of Fisheries and the Bureau of Biological Survey as a single conservation agency in the Department of the Interior.

Established by direction of Congress in 1938 as the medium through which authentic official information concerning the activities of the many bureaus and field agencies of the Department of the Interior might easily be made available for the public, the Division of Information is comprised of an editorial, radio, photographic, and publications section.

Indicative of the increased popular demand, the editorial section issued 1,126 public announcements during the year, as compared to 844 such announcements reporting to the public on operations of the 25 separate agencies of the Department in the preceding fiscal period.

Radio Section

Operating the only fully equipped radio studio in the Government service, the Department of the Interior through its Radio Section

made its facilities available to many Federal agencies in carrying forward the policies of conservation and national defense during the past year. With no transmitting equipment of its own, broadcast of the programs of the Department and other Federal establishments was made possible by cooperation of commercial radio stations of the United States with the Radio Section.

Altogether, these commercial stations cooperated for a total of 975 participations in presenting educational broadcasts based on conservation subjects. The number of such programs was 265, for which the cooperating stations contributed 2,340 hours of radio time without 1 cent of cost to the Government.

One of the programs prepared and presented by the Radio Section, *The Conservation Reporter*, is now in its second year as a weekly summary of conservation news presented coast-to-coast by the Mutual Broadcasting System.

In addition, 107 different conservation programs were electrically transcribed, and a total of 1,533 separate reproductions were made of these transcriptions and furnished for use by many school systems and educational institutions at their request.

Agencies of the Federal Government outside the Department of the Interior made increasing use of the studios, personnel, and mechanical equipment administered by the Radio Section during the fiscal year. Particularly important increases in requests for service came from the Office for Emergency Management, the Navy Department, and other agencies connected with defense activities.

In addition to the educational radio work performed for the Department of the Interior, a total of 169 programs were handled for these outside agencies. Two hundred and forty-one electrical transcriptions were produced from which a total of 21,391 duplicates were made. The number of cooperations with radio stations in this phase of the work totaled 3,056, and the total of radio time contributed was 8,080 hours.

Notable among the work carried on with educators was the completion within the fiscal year of a cooperative program in the State of California. Here, 2,000 high-school students took active part, under the direction of a representative of the Radio Section, in the study, research, writing, preparation, and radio production of subject matter based on conservation angles of the Central Valley project of the Bureau of Reclamation. Sixty-seven schools in 28 counties presented this material in a series of 80 broadcasts. The success of this cooperation was so pronounced that educational authorities hope to continue it through the coming scholastic year.

Photographic Section

The Photographic Section continued its increasingly valuable function of recording photographically the current activities of the Department and the distribution of such photographs to many types of publications.

Recordation projects of the year included an over-all coverage of the work of the Grazing Service; preliminary recording of conditions of erosion in Southwestern States incidental to the soil recovery program of the Office of Land Utilization; extensive additions to existing photographic coverage of national parks and monuments; complete photographic recordation of interiors and furnishings in the White House and in the Lee Mansion at Arlington, Va.; and visual documentation of achievements of the National Park Service in the restoration and maintenance of 13 National Historic Monuments and Battlefield Site areas in Southeastern States.

In addition to press releases, both national and regional, timely pictures were serviced to many types of popular and technical media and to educational groups and individuals. Considerable demand from representatives of Latin American countries for informative pictures of the current American scene was a significant development during the year. An increase of public interest in reclamation and other projects identified with national defense was indicated in the proportionately heavy distribution of photographs dealing with this type of subject.

The Motion Picture Distribution Office continued its general circulation of motion-picture film picturizing many phases of conservation and other work of the Department. These films were loaned upon request to educational institutions and other groups throughout the country and to some extent to neighboring countries.

Besides this film library service, duplicate positives of departmental films were made available by purchase to educational and other groups desiring the permanent inclusion of such films in their own libraries.

The wave of Latin-American interest in our national scene resulted in the inauguration of a project, now well under way, to release many of these departmental films with Spanish and Portuguese narration for circulation in Latin American countries.

Publications Section

During the past fiscal year the Publications Section, which acts as the liaison agency between the Department of the Interior and the Government Printing Office, was reorganized throughout to insure speedy delivery of technical bulletins, pamphlets, statistical data, maps, and charts vital to national defense.

Under the reorganization plan the Publications Section was made responsible for all Department manuscripts from the time they left the Bureaus until they were ready for distribution, the preparation of all manuscripts for printing, and the review and preparation of requisitions. Information on type face and size, lay-out, paper, and binding was furnished. The cost of printing and binding publications, forms, etc., was estimated and advice on budget estimates was furnished to the various Bureaus. Instructions were given to Bureau editors and personnel relating to the proper handling of manuscripts, editing copy, Government Style Manual, proofreading, and economy of printing and binding funds, and decisions were rendered on printing and binding regulations. The accounting of printing and binding for all Bureaus except the Geological Survey and other special funds was done in this section.

Between 3,000 and 4,000 requisitions were handled in the fiscal year. Of this number over 600 were for publications varying in size from 16 to 1,460 pages. Other activities were the distribution of Department publications throughout the United States, and maintenance of mailing lists adequate to insure the dissemination of information upon request of correspondents.

To bring about greater economy and efficiency in its operations, a board has been established in the Department of the Interior to standardize all forms. Technical guidance of this board is one of the functions of the Publications Section.

War Minerals Relief Commission

A. J. BARBER, Acting Commissioner

THE CLOSING CHAPTER in the adjustment and settlement of claims for net losses, incurred by mining operators who responded to stimulation by the Government during 1917 and 1918 to produce war minerals for the needs of the Nation during the World War and as to whom the Congress recognized a moral obligation by its enactment of the war minerals relief legislation, is submitted herewith.

Primarily this report covers the results of action during the fiscal year July 1, 1940, to June 30, 1941. Secondly, the report includes all action under the recent separate acts, with a summary of all actions under the War Minerals Relief Act and acts amendatory thereto.

Under the Act of February 13, 1929 (45 Stat. 1166):

Cases remaining in court by petitions for review of previous decisions by the Secretary of the Interior have been heard by the court, who dismissed or abated seven cases and entered decrees in one case directing the Secretary upon which items to review the claim.

Under decrees of court, the Secretary denied 3 claims and made 8 awards totaling \$82,161.51 in 11 claims.

These awards bring the total of awards under this act of February 13, 1929, to the sum of \$1,815,454.06.

Under the Act of May 18, 1936 (49 Stat. 1355):

The Secretary denied 8 claims and made 11 awards totaling \$60,048.64 in 19 claims.

These awards bring the total of awards under this act of May 18, 1936, to the sum of \$1,303,788.37, which amount exceeds the limitation of \$1,250,000 authorized by the act by the amount of \$54,775.54 in 9 awards.

Under the Act of June 30, 1936 (49 Stat. 2040):

The Secretary denied 11 claims and made 37 awards totaling \$226,663.93 in 48 claims.

These awards bring the total of awards under this act of June 30, 1936, to the sum of \$417,598.44.

Administrative Expenses:

For the period under review the salaries and expenses of the War Minerals Relief Commission total \$11,200 (approximate, pending final settlement of current outstanding bills).

These expenditures bring the total of the costs for administration of the acts of February 13, 1929, May 18, 1936, and June 30, 1936, to the sum of \$162,227.14 (approximate).

Summary

To make a complete report of the administration by the Secretary of the Interior of the authorizations and directions by the Congress in the War Minerals Relief acts, the adjustments and settlements made pursuant to these acts, from March 2, 1919, to June 30, 1941, are summarized as follows:

Acts of March 2, 1919, and November 23, 1921.....	\$7, 041, 942. 83	\$564, 468. 24	
Act of February 13, 1929.....	1, 815, 454. 06	-----	
Act of May 18, 1936.....	1, 303, 788. 37	-----	
Act of June 30, 1936.....	417, 598. 44	162, 227. 14	(approx.)
Total awards.....	10, 578, 783. 70	726, 695. 38	(approx.)
Total administrative expense.....	726, 695. 38		
Total expenditure under the War Minerals Relief acts...	11, 305, 479. 08		(approx.)

In accordance with the provision in the appropriation by the Congress for administrative salaries and expenses for the fiscal year July 1, 1940, to June 30, 1941 (54 Stat. 410), directing that any claim that has not been prosecuted and disposed of prior to July 1, 1941, shall not thereafter be considered by the Secretary of the Interior and shall be barred, it is submitted that all claims eligible for review under the War Minerals Relief Act of March 2, 1919 (40 Stat. 1272) as amended November 23, 1921 (42 Stat. 322), February 13, 1929 (45 Stat. 1166), May 18, 1936 (49 Stat. 1355), and June 30, 1936 (49 Stat. 2040) have been adjusted and settled by the Secretary of the Interior; and that all awards upon claims meriting reimbursement for net losses have been certified to the General Accounting Office.

With the completion of the work of examining into the merits of claims before the Secretary of the Interior under the War Minerals Relief Act, the War Minerals Relief Commission is disbanded.

As required by the original act of March 2, 1919, a report for the year ending June 30, 1941, with a final summary of disbursements under the War Minerals Relief acts has been forwarded to each branch of the Congress.

Board on Geographical Names

GEORGE C. MARTIN, *Executive Secretary*

THIS BOARD, established by the Secretary of the Interior to carry out the functions of the United States Geographic Board, transferred to him by Executive Order No. 6680, of April 17, 1934, is the official authority on the use of geographic names by the Government. In that capacity it decides unsettled questions as to the form, spelling, or application of geographic names, and considers new names proposed by Government officers. Its decisions, according to Executive Order No. 399, of January 23, 1906, are "to be accepted by the departments of the Government as the standard authority." The Board also serves as an informally recognized standard authority in the nongovernmental use of geographic names, and furnishes information on geographic names in response to requests from governmental and outside sources.

The Board consists of an advisory committee, in which various governmental departments and geographic societies are represented, which acts chiefly through its executive committee, and of an administrative and investigative unit, called the Division of Geographic Names, in the office of the Secretary of the Interior. The personnel of the advisory and executive committees, on June 30, 1941, was as follows:

Advisory Committee

- Lt. Comdr. K. T. Adams, Coast and Geodetic Survey, Department of Commerce.
- Mr. Roscoe E. Baber, foreign language editor and translator, member Style Board, Government Printing Office.
- Mr. Clarence Batschelet, geographer, Bureau of the Census, Department of Commerce.
- Mr. James M. Darley, chief cartographer, National Geographic Society.
- Mr. E. E. Carter, Chief, Division of Timber Management, Forest Service, United States Department of Agriculture.
- Mr. William J. Dixon, Superintendent, Division of Postmasters, Post Office Department.
- Dr. William H. Haas, professor of geology and geography, Northwestern University, representing the Geographic Society of Chicago.

Commander Henry Hartley, officer in charge, Division of Maritime Security, Hydrographic Office, Navy Department.

Mr. W. L. G. Joerg, Chief, Division of Maps and Charts, The National Archives.

Lt. Col. Lawrence Martin, Chief, Division of Maps, and Incumbent, Chair of Geography, Library of Congress.

Dr. W. C. Mendenhall, Director, Geological Survey, United States Department of the Interior.

Mr. Raye R. Platt, Research Associate, American Geographical Society of New York.

Mrs. Sophia A. Saucerman, assistant geographer, Department of State.

Dr. John R. Swanton, Bureau of American Ethnology, Smithsonian Institution.

Dr. Frank E. Williams, professor of geography, Wharton School of Finance and Commerce, University of Pennsylvania, representing the Geographical Society of Philadelphia.

EXECUTIVE COMMITTEE

Mr. W. L. G. Joerg, *Chairman*

Mr. E. E. Carter

Lt. Comdr. K. T. Adams

The advisory committee held two meetings during the year, at which matters of general policy and reports of interim action by the executive committee and by the executive secretary were considered. The executive committee held 21 meetings at which 662 names were approved. Decisions on those names are included in a pamphlet entitled "Decisions of the United States Board on Geographical Names Rendered Between July 1, 1940, and June 30, 1941," which can be obtained from the Board without charge.

The locations of the features on the names of which decisions were rendered, and the sources of the requests for decisions, are as follows:

Geographic Distribution of Names

Arizona.....	169	Maryland.....	9	Kansas.....	2
Michigan.....	81	Pacific Ocean.....	9	Wyoming-Montana..	2
Washington.....	76	Arkansas.....	7	Delaware.....	1
Alaska.....	65	Connecticut.....	7	Idaho.....	1
Wisconsin.....	26	Massachusetts.....	7	Missouri.....	1
Florida.....	18	Maine.....	6	Oklahoma.....	1
Virginia.....	18	Texas.....	6	Rhode Island.....	1
Georgia.....	16	Nevada.....	5	Utah.....	1
North Carolina.....	16	South Carolina.....	5	Vermont.....	1
Alabama.....	15	South Dakota.....	5	West Virginia.....	1
California.....	15	Minnesota.....	4	North Carolina-	
Montana.....	14	Nebraska.....	4	Virginia-West	
Colorado.....	12	New Jersey.....	4	Virginia.....	1
New York.....	12	Louisiana.....	3		
Oregon.....	12	Wyoming.....	3	Total.....	662

Sources of Requests for Decisions

U. S. Coast and Geodetic Survey---	197	Tennessee Valley Authority-----	5
Office of Indian Affairs-----	158	Bureau of Agricultural Economics--	4
U. S. Forest Service-----	128	General Land Office-----	3
U. S. Geological Survey-----	63	Bureau of Public Roads-----	1
State organizations-----	54	International Boundary Commis-	
National Park Service-----	21	sion-----	1
War Department-----	15		
Soil Conservation Service-----	12	Total-----	662

Interior Department Museum

H. L. RAUL, Museum Curator

ILLUSTRATING by clear visual educational methods how the Department of the Interior functions in contributing to national defense and in promoting intelligent conservation of natural resources, the Interior Department Museum in Washington continued to serve as an important adjunct in the field of both child and adult enlightenment during the 1941 fiscal year.

With more than 50,000 visitors studying the exhibits during the year, an increase of more than 20 percent in the number of school children was indicative of the increased emphasis given the study of conservation in many State educational programs.

During the past year, visitors were registered from every State in the Union. Registrations also were received from Alaska, Hawaii, Virgin Islands, Little America, Antarctica, Philippine Islands, and Puerto Rico; also from Australia, Austria, Brazil, Bolivia, British South Africa, Canada, China, Cuba, Dominican Republic, El Salvador, England, France, Greece, Guatemala, Iceland, Italy, Mexico, Northern Rhodesia, Norway, Peru, Rumania, and Switzerland.

It is of particular and timely interest that a number of persons from South American countries visited the Museum during the past year. Not only has the Museum displayed special exhibits relating to South American interests, but in other ways has contributed a part in the wide field of hemisphere solidarity. The Museum has cooperated with other institutions, whenever requested by them, including the National Museum, the Montclair Art Museum, and the Pan American Union.

Originally envisioned by Secretary Ickes as the most logical and efficient instrument to visualize and explain the manifold activities of the Department, the Interior Museum appropriately has been called an Exposition of Conservation. Installed in 10 exhibit galleries on the first floor of the New Interior Department Building, the displays include not only representations of Bureaus that are engaged directly in national preparedness activities, but, in general, the Museum

technique employed dramatizes and explains the constructive conservation activities of the Department, so important in an all-out defense program.

Presenting a broad cross section of departmental activities, the Museum contains paintings of historic events, lifelike dioramas, excellent examples of Indian arts and crafts, many rare and unusual documents, and interesting scientific models.

Under the program of administering the Museum as a live institution, guided tours, new exhibit installations, and special exhibits, were among the services rendered during the past year. A special display relative to the three newest national parks—Kings Canyon, Isle Royale, and Olympic—was installed, together with a framed map showing the locations of all the national parks. Opposite this feature is a newly installed hand-colored giant map of the United States.

Among the developments of the past year was the installation of a new exhibit depicting the origin, history, and current activities of the Grazing Service of the Department in administering the 142,000,000 acres of Federal range land. This exhibit attained added significance with the transfer of Service headquarters from the National Capital to Salt Lake City, Utah.

An important feature, new to Museum technique, was originated and used in several of the exhibits during the past year. This new feature is the "Editorial Label" method of treatment, which consists of an authoritative expression of opinion, interpreting each exhibition as a whole, supplementing the usual detail description labels.

Plans have been completed and are in course of installation pertaining to revisions of bureau exhibits. Several new sections have been installed during the past year. Among them were the displays relating to the Fish and Wildlife Service, which included a colorful diorama on the Tarpon Springs Sponge Industry and a collection of mounted fish specimens. Other new accessions were a large framed polished cross section of a specimen concrete core from Grand Coulee Dam with engineering specifications, and a similar exhibit from Boulder Dam, displayed in the Bureau of Reclamation gallery; a collection of Arapahoe and Cheyenne arrows, retrieved from dying buffalos by Lt. William Noble Williams, at Fort Sill, Indian Territory (Oklahoma), in 1868, and historical old telegraph pole insulators used on the first transcontinental telegraph line in 1861.

A collection of rare books on fish (33 volumes) has been deposited in the Museum by the library of the Fish and Wildlife Service for display in connection with the exhibits of that Service. Among the books is a rare copy of *Rondellet de Piscibus*, published in 1554, and one copy of *Historiae Brasiliae*, published in 1648.

Special displays on view during the past year were an exhibit on the United States Antarctic Service Expedition, by the Division of Terri-

tories and Island Possessions; Pharmaceutical Preparations Derived from Fish, by the Fish and Wildlife Service; and a Pageant of the Pacific, consisting of lithogravure reproduction of mural maps by Miguel Covarrubias, presented to Secretary of the Interior Harold L. Ickes, by Dr. Ray Lyman Wilbur, president of Stanford University.

The Grazing Service traveling exhibit, prepared by the Museum and consisting of 14 exhibit panels, was shown in New York City by the United States Travel Bureau.

Thousands of pamphlets and copies of literature, supplied by the bureaus, were distributed during the year. Numerous inquiries were handled daily at the Museum information desk and special assistance rendered whenever requested.

The contacts of the Interior Department Museum were by no means limited to the more than 4,000 persons who visited the displays each month. As an extension service, educational exhibit material was prepared and forwarded for public use in other localities.

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